Public Works Standards

Design Standards | Standard Specifications | Standard Details

CITY OF GRESHAM

Public Works Standards

Design Standards

Standard Specifications

Standard Details

January 1, 2019

Revised: January 1, 2020

CITY OF GRESHAM

DEPARTMENT OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM, OREGON

Approved: _____

Steve Fancher
Director

RESOLUTION NO. 3336

A RESOLUTION ADOPTING PUBLIC WORKS STANDARDS AND REPEALING RESOLUTION NOS. 2812 AND 2931

The City of Gresham Finds:

A. On November 1, 2005, by Resolution No. 2812, the City adopted Public Works Standards, containing four sections: Design Standards, Construction Specifications, Standard Drawings, and the Erosion Prevention Sediment Control Manual.

B. On April 15, 2008, by Resolution No. 2931, the City amended the Public Works Standards by adopting Parks Design Standards for Park Projects as a part of the Public Works Standards.

C. The Public Work Standards were initially reviewed and revised by City staff.

D. Notice was provided to subscribers of the Public Works Standards, private utility providers, others in the development community, and the Neighborhood Coalition and posted on the project website. All comments received were reviewed and a majority of the comments incorporated into the updated Public Work Standards.

E. The Erosion Prevention Sediment Control Manual will be moved into the Stormwater Management Manual.

THE CITY OF GRESHAM RESOLVES:

1. The Gresham City Council adopts the Public Works Standards, attached hereto as Exhibit A, containing three sections: Design Standards, Standard Specifications and Standard Details as the design and construction standards for all public and privately financed public works projects.

2. The Manager is authorized to update the Public Works Standards including, if recommended by the City Attorney, changes to Chapter 100 regarding legal issues. Any change that has a significant policy implication shall be brought to Council for approval.

3. Resolution Nos. 2812 and 2931 are hereby repealed.

4. This resolution is effective on January 1, 2019.

Yes: Bemis, French, Gladfelter, Palmero, Widmark

No: None

Absent: Echols, Hinton

Abstain: None

Passed by the Gresham City Council on October 16, 2018.

Erik Kvarsten
City Manager

Shane T. Bemis
Mayor

Approved as to Form:

David R. Ris
City Attorney

City of Gresham
Department of Environmental Services
1333 NW Eastman Parkway
Gresham, Oregon 97030-3813
503-618-2525
Fax 503-661-5927
www.greshamoregon.gov

CITY OF GRESHAM

PUBLIC WORKS STANDARDS ORDER FORM

Name _____ *Title* _____

Organization _____ *Department* _____

Address _____

City _____ *State* _____ *Zip Code* _____

Phone Number _____ *Fax Number* _____ *E-mail Address* _____

Copies	Item	Unit Price (Each)	Total
_____	Public Works Standards Document	$75.00	_____
_____	Public Works Standards on CD	$25.00	_____
		Grand Total:	_____

Send order to: City of Gresham, Department of Environmental Services
1333 NW Eastman Parkway, Gresham, OR 97030-3813

DESIGN STANDARDS TABLE OF CONTENTS

CHAPTER 1 - GENERAL DESIGN

1.01 Authority and Purpose 1
1.02 Definitions 1
1.03 Engineering Policy 6
1.04 Applicability 6
1.05 Standard Specifications 6
1.06 Approval of Alternate Materials or Methods 6
1.07 Special Design Problems 6
1.08 Revisions to Public Works Standards 7

CHAPTER 2 - GENERAL TECHNICAL DESIGN

2.01 Construction Plan General Information 1
2.02 CAD Drafting Standards 1
2.03 Existing City As-Built Plans 1
2.04 Supporting Information 1
2.04.01 Geotechnical Report 1
2.04.02 Stormwater Report 1
2.04.03 Stormwater Facility Operations and Maintenance Plan 2
2.05 Plan Submittal 2
2.06 As-Built Plan Requirements 2
2.07 Easements 2
2.07.01 General Utility Easements (GUE) 2
2.07.02 Public Utility Easements 2
2.08 Depths of Bury for Pipes 4
2.09 Private Utilities in Rights-of-Way 4

CHAPTER 3 - WASTEWATER SYSTEM DESIGN

3.01 General Design Requirements 1
3.02 Minimum Design Criteria 1
3.03 Alignment and Cover 3
3.03.01 Right-of-way Location 4
3.03.02 Minimum Depth 4
3.03.03 Maximum Depth 4
3.03.04 Easements 4

3.03.05 Separation with Utilities 4
3.03.06 Relation to Watercourses 4
3.04 Pipe Materials and Size 5
3.05 Structures 5
3.05.01 Access 5
3.05.02 Manholes 5
3.05.03 Cleanouts 6
3.06 Sanitary Sewer Laterals 6
3.07 Connection to Existing Sewers 7
3.08 Private Sewer Lines 7
3.09 Subsurface Disposal 7
3.10 Wastewater Pump Station Design Standards 8
3.10.01 General 8
3.10.02 Design 8
3.10.03 Key Components 8

CHAPTER 4 - STORMWATER DRAINAGE SYSTEM DESIGN

4.01 General Design Requirements 1
4.02 Minimum Design Criteria 2
4.03 Alignment and Cover 2
4.03.01 Right-of-way Location 2
4.03.02 Minimum Depth 2
4.03.03 Maximum Depth 3
4.03.04 Easements 3
4.03.05 Relation to Watercourses 3
4.03.06 Outfalls on Slopes 3
4.04 Pipe Materials and Size 3
4.05 Structures 4
4.05.01 Access 4
4.05.02 Manholes 4
4.05.03 Stormwater Inlets 4
4.05.04 Outfall Protection 5
4.06 Culverts 7
4.06.01 Inlet and Outlet Control Analysis 7
4.06.02 Headwalls and Endwalls 8
4.07 Conveyance Systems 8
4.07.01 Hydraulic Design 9
4.08 Downstream Analysis Report 9

4.09 Erosion Prevention and Sediment Control 9
4.10 Stormwater Flow Control (Detention/Retention) 9
4.11 Stormwater Quality Treatment 9
4.12 Open Channel Design 9
4.13 Rear Lot Drainage 10
4.14 Private Storm Drain Systems 10

CHAPTER 5 - WATER SYSTEM DESIGN

5.01 General Design Requirements 1
5.02 Alignment and Cover 1
5.02.01 Right-of-way Location 2
5.02.02 Minimum Depth 2
5.02.03 Maximum Depth 2
5.02.04 Separation with Sanitary Sewer Lines 2
5.02.05 Separation with Utilities Other than Sanitary Sewer Lines 3
5.02.06 Easements 3
5.02.07 Relation to Watercourses 3
5.03 Pipe Materials and Size 3
5.04 Appurtenances 4
5.04.01 Valves 4
5.04.02 Fittings 4
5.04.03 Fire Hydrants 5
5.04.04 Pressure-reducing and Combination Air Valve Units 5
5.04.05 Railroad or Freeway Crossings 6
5.05 Backflow Prevention 6
5.06 Water Service Lines 6
5.07 System Testing 7
5.08 Water Quality Sampling Stations 7

CHAPTER 6 - TRANSPORTATION DESIGN

6.01 General Design Requirements 1
6.01.01 Access 1
6.01.02 Permanent Dead-end Streets 1
6.01.03 Traffic Analysis 2
6.02 Streets 5
6.02.01 General 5
6.02.02 Functional Classification 5

6.02.03 Alleys 5
6.02.04 Private Accessways 6
6.02.05 Right-of-way and Pavement Width 6
6.02.06 Half-street and Frontage Improvement Construction 7
6.02.07 Pavement Design 7
6.02.08 Design Speed 8
6.02.09 Horizontal Curves 9
6.02.10 Vertical Curves 9
6.02.11 Grades 9
6.02.12 Concrete Curb 10
6.02.13 Intersections 10
6.02.14 Curb Return Radius 11
6.02.15 Parking 12
6.02.16 Local Street Design for Adverse Topography 12
6.02.17 Streetlighting 12
6.02.18 Street Trees 15
6.02.19 Street Names and Traffic Control Signage 16
6.02.20 Pavement Markings 16
6.03 Driveways 17
6.04 Sidewalks 18
6.04.01 Sidewalk Width 18
6.04.02 Sidewalk Ramps 18
6.04.03 Asphalt Transition Sidewalk Ramps 19
6.05 Pedestrian/Bicycle Facilities 20
6.05.01 Bicycle Facilities 20
6.05.02 Multi-use Paths and Trails 20

CHAPTER 7 - PARKS DESIGN

7.01 General Design Requirements 1
7.01.01 General 1
7.01.02 Park Standard Details and Specifications 1
7.01.03 Additional Technical Specifications 1
7.01.04 Irrigation System Submittals 1
7.02 Planning Process 2
7.02.01 Developer Constructed Parks 2
7.03 Parkland Descriptions 3
7.03.01 Neighborhood Parks and Pocket Parks 3
7.03.02 Community Parks 4

7.03.03 Urban Plazas and Town Squares 5
7.03.04 Natural Areas and Greenways 6
7.03.05 Trails, Trailheads and Multi-Use Paths 6
7.03.06 Regional Parks 7
7.04 Design Requirements 8
7.04.01 Grading 8
7.04.02 Planting 8
7.04.03 Water, Irrigation, and Drinking Fountains 8
7.04.04 Lighting 9
7.04.05 Designing for Maintenance 9
7.04.06 Structures 9
7.04.07 Stairs and Bridges 9
7.04.08 Play Structures 10
7.05 Signage Program 10
7.06 Product Standards 10
7.06.01 Site Furnishing Product Standards 10
7.06.02 Restroom Product Standards 14
7.06.03 Irrigation Product Standards 15

STANDARD SPECIFICATIONS TABLE OF CONTENTS

CHAPTER 100 - GENERAL REQUIREMENTS

101 DEFINITIONS, ABBREVIATIONS, AND PRIVATELY FINANCED PUBLIC IMPROVEMENT REQUIREMENTS

101.01 Definitions 1
101.02 Abbreviations 5
101.03 Applicability of Public Works Standards to Privately Financed Public Improvements 5

102 INSTRUCTIONS TO BIDDERS

102.01 Solicitation Protest (Not applicable to privately financed public improvements) 6
102.02 Bid Provisions (Not applicable to privately financed public improvements) 6
102.03 Qualification of Bidders And Contractors (Not applicable to privately financed public improvements) 7
102.04 Form of Bid (Not applicable to privately financed public improvements) 7
102.05 Withdrawal, Modification, Or Alteration of Bid (Not applicable to privately financed public improvements) 8
102.06 Late Offers (Not applicable to privately financed public improvements) 8
102.07 Bid Security (Not applicable to privately financed public improvements) 8
102.08 Addenda (Not applicable to privately financed public improvements) 8
102.09 Examination of The Contract Documents, Site Of Work, And Subsurface Data (Not applicable to privately financed public improvements) 9
102.10 Familiarity with Laws and Ordinances (Not applicable to privately financed public improvements) 9
102.11 Unit Prices (Not applicable to privately financed public improvements) 9
102.12 Rejection of Offers (Not applicable to privately financed public improvements) 9
102.13 Conflict of Interest (Not applicable to privately financed public improvements) 9

103 LEGAL RELATIONS AND RESPONSIBILITIES

103.01 Applicable Laws and Venue 10
103.02 Equal Employment Opportunity/Affirmative Action 10
103.03 Subcontractors 10
103.04 No Waiver of Legal Rights (Not applicable to privately financed public improvements) 10
103.05 Other Contracts 11
103.06 Liability and Indemnification 12
103.07 Insurance (Not applicable to privately financed public improvements) 12
103.08 Royalties and Patents 14

103.09 Permits 14
103.10 Sanitary Facilities at Construction Projects 15
103.11 Compliance with Oregon Revised Statutes Chapters 279a and 279c (Not applicable to privately financed public improvements) 15
103.12 Labor 16
103.13 Prevailing Wages (Not applicable to privately financed public improvements) 16
103.14 Overtime for City Personnel 16
103.15 Safety 17
103.16 Two (2) Year Warranty 18
103.17 Street Cut/Dig Moratorium After Major Street Work 19
103.18 Contractor Is Independent Contractor (Not applicable to privately financed public improvements) 20
103.19 Successors in Interest 20
103.20 Construction Contractor's Board 20
103.21 Severability 20
103.22 Merger Clause (Not applicable to privately financed public improvements) 21
103.23 No Third-Party Beneficiaries (Not applicable to privately financed public improvements) 21
103.24 Examination of The Contract Documents, Site of Work, And Subsurface Data 21
103.25 Familiarity With Laws and Ordinances 21

104 AWARD AND EXECUTION OF THE CONTRACT

104.01 Award of The Contract (Not applicable to privately financed public improvements) 23
104.02 Selection Protest (Not applicable to privately financed public improvements) 23
104.03 Execution Of The Contract (Not applicable to privately financed public improvements) 24
104.04 Transfer of The Contract And Interests Therein (Not applicable to privately financed public improvements) 24
104.05 Performance And Payment Bonds; Warranty Guarantee 25
104.06 Certificate of Insurance (Not applicable to privately financed public improvements) 25
104.07 Failure To Execute The Contract (Not applicable to privately financed public improvements) 25
104.08 Return of Bid Security (Not applicable to privately financed public improvements) 26

105 SCOPE OF WORK

105.01 Plans and Specifications 26
105.02 Precedence of The Contract Documents 26
105.03 Shop Drawings and Other Submittals (Not applicable to privately financed public improvements) 26

105.04 Changes in The Work 28
105.05 Force Account Work (Not applicable to privately financed public improvements) 28
105.06 Salvage 28

106 PROSECUTION AND PROGRESS OF WORK

106.01 Contractor's Construction Schedule 28
106.02 Preconstruction Conference 29
106.03 Contractor's Representative 29
106.04 Notice to Proceed 29
106.05 Contract Time 30
106.06 Suspension of Work 30
106.07 Delays and Extensions of Time (Not applicable to privately financed public improvements) 32
106.08 Contract Incentive and Liquidated Damages (Not applicable to privately financed public improvements) 32
106.09 Record Drawings 33
106.10 Conflicts, Errors, Omissions, and Additional Drawings 33
106.11 The City's Right to Do Work 33
106.12 Termination for Default (Not applicable to privately financed public improvements) 34
106.13 Termination in The Public Interest (Not applicable to privately financed public improvements) 35

107 CONTROL OF WORK

107.01 Authority of The Project Manager and Engineer 35
107.02 Authority and Duties of Inspectors 36
107.03 Responsibility of The Contractor 36
107.04 Notification of Utilities and Agencies 36
107.05 Utilities and Existing Improvements 37
107.06 Survey Service 38
107.07 Protection of Survey Markers 38
107.08 Protection of Property 39
107.09 Rights-Of-Way, Easements, and Premises 39
107.10 Use of Work During Construction 40
107.11 Furnishing Temporary Services and Facilities 40
107.12 Verbal Agreements or Representations 40
107.13 Environmental Pollution Control 40
107.14 Noise 41
107.15 Access to The Work 41
107.16 Defective or Unauthorized Work 41

107.17 Railroad Crossings or Right-Of-Way 42

108 CONTROL OF MATERIALS

108.01 Preference for Use of Oregon Products (Not applicable to privately financed public improvements) 42
108.02 Quality of Work 42
108.03 Sampling and Testing 42
108.04 Proof of Compliance 43
108.05 Inspection by Others 43
108.06 Storage and Protection of Items of Work 43
108.07 Trade Names, Equals, or Substitutions 43

109 MEASUREMENT AND PAYMENT

109.01 Measurement of Quantities (Not applicable to privately financed public improvements) 44
109.02 Scope of Payment (Not applicable to privately financed public improvements) 45
109.03 Compensation for Alteration of The Contract (Not applicable to privately financed public improvements) 45
109.04 Payment for Change Orders (Not applicable to privately financed public improvements) 46
109.05 Claims and Notice (Not applicable to privately financed public improvements) 49
109.06 The City's Right to Access Contractor's Records (Not applicable to privately financed public improvements) 50
109.07 Payments and Retainage (Not applicable to privately financed public improvements) 51
109.08 Completion, Final Pay Estimate, and Final Payment (Not applicable to privately financed public improvements) 53

CHAPTER 200 - GENERAL TECHNICAL REQUIREMENTS

201 EROSION PREVENTION AND SEDIMENT CONTROL

201.01 Description 1
201.02 Materials 1
201.03 Construction 1
201.04 Measurement and Payment (Not applicable to privately financed public improvements) 1
201.04.01 Lump Sum Basis 1
201.04.02 Incidental Basis 1

202 TRAFFIC CONTROL

202.01 Description 1

202.02 Materials 1

202.02.01 Uniform Traffic Control Devices 1

202.03 Construction 2

202.03.01 General 2

202.03.02 Traffic Lane and Sidewalk Restriction Requirements 3

202.03.03 Traffic Control Plans 5

202.03.04 Construction and Maintenance of Detours 6

202.03.05 Flagging Requirements 7

202.04 Measurement and Payment (Not applicable to privately financed public improvements) 7

202.04.01 Lump Sum Basis 7

202.04.02 Incidental Basis 7

203 MOBILIZATION

203.01 Description 7

203.02 Materials 7

203.03 Construction 8

203.04 Measurement and Payment (Not applicable to privately financed public improvements) 8

203.04.01 Lump Sum Basis 8

203.04.02 Incidental Basis 8

204 CLEARING AND GRUBBING

204.01 Description 8

204.02 Materials 9

204.03 Construction 9

204.03.01 General 9

204.03.02 Timber Salvage 9

204.03.03 Protection of Existing Vegetation 10

204.03.04 Protection of Migratory Birds 10

204.03.05 Clearing 10

204.03.06 Clearing Borrow and Waste Disposal Areas 10

204.03.07 Grubbing and Stripping 10

204.03.08 Disposal of Waste Material 11

204.03.09 Backfilling and Clean-up 11

204.03.10 Removal and Replacement of Signs, Mailboxes, Posts, etc. 11

204.04 Measurement and Payment (Not applicable to privately financed public improvements) 11
204.04.01 Lump Sum Basis 11
204.04.02 Incidental Basis 11

205 MATERIALS - TYPES AND USE

205.01 Description 11
205.02 Materials 11
205.02.01 General 11
205.02.02 Explosives 11
205.02.03 Water 12
205.02.04 Aggregates 12
205.02.05 Portland Cement 16
205.02.06 Cement Mortar 16
205.02.07 Cement Grout 16
205.02.08 Epoxy Cement 17
205.02.09 Portland Cement Concrete 17
205.02.10 Asphalt Materials 19
205.02.11 Geotextiles 20
205.03 Construction 23
205.03.01 Geotextiles 23
205.04 Measurement and Payment (Not applicable to privately financed public improvements) 26
205.04.01 Geotextiles 26

206 EXCAVATION, EMBANKMENT, BEDDING, AND BACKFILL

206.01 Description 26
206.01.01 General 26
206.01.02 Unclassified Excavation 26
206.01.03 Rock Excavation 26
206.01.04 Trench Excavation 27
206.01.05 Embankment 27
206.01.06 Foundation Stabilization 27
206.01.07 Pipe Zone 27
206.01.08 Trench Backfill 27
206.02 Materials 27
206.02.01 Embankment Materials 27
206.02.02 Foundation Stabilization 28
206.02.03 Pipe Zone Material 28

206.02.04 Native Backfill Material 28
206.02.05 Select Backfill Material 28
206.02.06 Riprap 30
206.02.07 Imported Topsoil 31
206.02.08 Native Topsoil 31
206.02.09 Stormwater Facility Topsoil 31
206.02.10 Water 31
206.03 Construction 31
206.03.01 Excavation 31
206.03.02 Rock Excavation and Explosives 31
206.03.03 Preservation of Existing Improvements 32
206.03.04 Excavation of Existing Improvements and Miscellaneous 32
206.03.05 Limits of Excavation 33
206.03.06 Slope Grading 33
206.03.07 Foundation Stabilization 33
206.03.08 Disposal of Excess Material 33
206.03.09 Temporary Location of Excavated Materials 33
206.03.10 Surface Removal and Replacement for Trenches 33
206.03.11 Trench Excavation and Shoring 34
206.03.12 Dewatering 36
206.03.13 Compaction 36
206.03.14 Embankment 37
206.03.15 Pipe or Conduit Bedding and Pipe Zone 38
206.03.16 Trench Backfill and Compaction 38
206.03.17 Topsoil 41
206.04 Measurement and Payment (Not applicable to privately financed public improvements) 41
206.04.01 Unclassified Excavation 41
206.04.02 Rock Excavation 43
206.04.03 Hard Surface Removal and Replacement for Trenches 43
206.04.04 Embankment 43
206.04.05 Foundation Stabilization 44
206.04.06 Pipe or Conduit Bedding and Pipe Zone 44
206.04.07 Riprap 44
206.04.08 Imported Topsoil 44
206.04.09 Shoring 44
206.04.10 Dewatering 45

207 BORING AND JACKING

207.01 Description 45

207.01.01 Boring 45

207.01.02 Jacking 45

207.01.03 Permits 45

207.02 Materials 45

207.02.01 Pipe Bedding and Pipe Zone Material 45

207.02.02 Pipe 45

207.02.03 Casing 45

207.02.04 Grout 46

207.02.05 Stainless Steel Bands 46

207.02.06 Supports, Skids, and Casing Spacers 46

207.03 Construction 46

207.03.01 General 46

207.03.02 Excavation 46

207.03.03 Alternate of Jacking or Boring 47

207.03.04 Jacking and Boring 47

207.03.05 Concrete Pipe and Box Section 47

207.03.06 Smooth Steel Casing 47

207.03.07 Grouting Voids Outside Casing or Carrier Pipe 47

207.03.08 Cased Pipe 48

207.03.09 Grouting Voids Between Carrier Pipe and Casing 48

207.03.10 Railroad Crossings 48

207.03.11 Contractor's Responsibility 48

207.04 Measurement and Payment (Not applicable to privately financed public improvements) 48

207.04.01 Boring and Jacking 48

207.04.02 Jacking or Boring In Lieu of Open Trench 49

208 CONCRETE STRUCTURES

208.01 Description 49

208.02 Materials 49

208.02.01 Portland Cement 49

208.02.02 Aggregates 49

208.03 Construction 49

208.03.01 General 49

208.03.02 Mix Design 49

208.03.03 Consistency 50

208.03.04 Measurement of Materials 50
208.03.05 Mixing 51
208.03.06 Falsework 52
208.03.07 Forms 53
208.03.08 Removal of Falsework and Forms 53
208.03.09 Weather Limitations 54
208.03.10 Handling and Placing 54
208.03.11 Construction Joints 56
208.03.12 Expansion and Fixed Joints 56
208.03.13 Surface Finishing 57
208.03.14 Curing 58
208.03.15 Protection of Concrete 58
208.04 Measurement And Payment (Not applicable to privately financed public improvements) 59
208.04.01 Concrete 59

209 LANDSCAPING AND LANDSCAPE RESTORATION

209.01 Description 59
209.02 Materials 60
209.02.01 Plants 60
209.02.02 Seed 60
209.02.03 Sod 60
209.02.04 Topsoil 60
209.02.05 Sand 60
209.02.06 Organic Material for Soil Amendment 60
209.02.07 Lime 60
209.02.08 Subdrains 61
209.02.09 Irrigation and Water Systems 61
209.02.10 Fertilizer 61
209.02.11 Mulch and Ground Covers 62
209.02.12 Tie-Downs 62
209.02.13 Soil Sterilant 62
209.03 Construction 62
209.03.01 General 62
209.03.02 Soil Test 63
209.03.03 Lawns and Grass 63
209.03.04 Trees, Shrubs, and Ground Cover 65
209.03.05 Irrigation Systems 68

209.04 Measurement and Payment (Not applicable to privately financed public improvements) ... 69
209.04.01 Incidental Basis ... 69
209.04.02 Unit Price Basis ... 69
209.04.03 Lump Sum Basis ... 69

210 RESURFACING

210.01 Description ... 69
210.02 Materials ... 69
210.02.01 Asphalt Concrete ... 69
210.02.02 Pavement Base ... 69
210.02.03 Forms ... 69
210.02.04 Rock Surfacing ... 69
210.02.05 Subgrade ... 69
210.03 Construction ... 69
210.03.01 Street Maintenance ... 69
210.03.02 Temporary Hot or Cold Mix Asphalt ... 70
210.03.03 Pavement Base ... 70
210.03.04 Asphalt Concrete Pavement ... 70
210.03.05 Portland Cement Concrete Pavement ... 71
210.03.06 Rock Surfacing ... 72
210.03.07 Concrete Driveways, Sidewalks, and Curbs ... 72
210.04 Measurement and Payment (Not applicable to privately financed public improvements) ... 72
210.04.01 Temporary Hot or Cold Mix Asphalt ... 72
210.04.02 Rock Surfacing ... 72
210.04.03 Asphalt Concrete and Portland Cement Pavement Replacement ... 72
210.04.04 Sidewalk and Driveway Replacement ... 73
210.04.05 Curb Replacement ... 73
210.04.06 Removal and Replacement of Culverts, Stormwater Lines, or Catch Basins ... 73

211 RESTORATION AND CLEANUP

211.01 Description ... 73
211.02 Materials ... 73
211.03 Construction ... 74
211.03.01 Surface Dressing ... 74
211.03.02 Removal of Materials ... 74
211.03.03 Cleaning Drains ... 74
211.03.04 Cleaning Paved Surfaces and Appurtenances ... 74

211.03.05 Restoring Planted Areas 74
211.03.06 Restoring Mobilization, Borrow, and Disposal Areas 74
211.03.07 Removal of Signs 74
211.03.08 Restoring Curbs, Sidewalks, and Driveways 75
211.04 Measurement and Payment (Not applicable to privately financed public improvements) 75
211.04.01 Lump Sum Basis 75
211.04.02 Incidental Basis 75

CHAPTER 300 - WASTEWATER TECHNICAL REQUIREMENTS

301 PIPES AND FITTINGS

301.01 Description 1
301.02 Materials 1
301.02.01 General 1
301.02.02 Reinforced Concrete Pipe 1
301.02.03 Ductile Iron Pipe 5
301.02.04 Polyvinyl Chloride (PVC) Pipe 6
301.02.05 High Density Polyethylene (HDPE) Pipe, Solid Wall 6
301.02.06 Service Connection Markers 8
301.02.07 Cleanouts 8
301.03 Construction 8
301.03.01 Excavation and Backfill 8
301.03.02 Line and Grade for Gravity and Pressure Sanitary Sewers 9
301.03.03 Pipe Distribution and Handling 9
301.03.04 Pipe Laying and Jointing of Pipes and Fittings 9
301.03.05 Installation of Sanitary Sewer Laterals, Tees, and Wyes 11
301.03.06 Service Connection Markers 12
301.03.07 Closure Collars 12
301.03.08 Field Fabricated Connections 12
301.03.09 Cleanouts 13
301.03.10 Service Risers 13
301.03.11 Testing 13
301.04 Measurement and Payment (Not applicable to privately financed public improvements) 17
301.04.01 Sanitary Sewer Pipe 17
301.04.02 Service Risers 18
301.04.03 Tee and Wye Fittings 18
301.04.04 Closure Collars 18

301.04.05 Field Fabricated Connections 18
301.04.06 Cleanouts 19
301.04.07 Other Items 19

302 MANHOLES AND CONCRETE STRUCTURES

302.01 Description 19
302.02 Materials 19
302.02.01 Base Rock 19
302.02.02 Forms 19
302.02.03 Concrete and Reinforcing Steel 19
302.02.04 Cement Mortar 19
302.02.05 Manholes 20
302.02.06 Manhole and Cleanout Frames and Covers 21
302.02.07 Non-shrink Grout 22
302.02.08 Drop Assemblies 22
302.02.09 Concrete Encasement 22
302.03 Construction 22
302.03.01 General 22
302.03.02 Manholes 23
302.03.03 Drop Assemblies 24
302.03.04 Pipe Stub-outs from Manholes 24
302.03.05 Manhole Grade Rings 24
302.03.06 Manhole and Cleanout Frames and Covers 24
302.03.07 Vacuum Testing 24
302.03.08 Concrete Encasement 25
302.03.09 Anchor Walls 25
302.03.10 Manhole Steps 25
302.03.11 Cleaning 25
302.04 Measurement and Payment (Not applicable to privately financed public improvements) 26
302.04.01 Manholes 26
302.04.02 Drop Assemblies 26
302.04.03 Tamperproof and Watertight Manhole Frames and Covers 26
302.04.04 Concrete Encasement 26
302.04.05 Anchor Walls 26
302.04.06 Other Items 26

303 WORK ON EXISTING SANITARY SEWER PIPES

303.01 Description 27

303.02 Materials 27

303.02.01 Pipe Patch Repair 27

303.03 Construction 27

303.03.01 Excavation and Backfill 27

303.03.02 New Manholes Over Existing Sanitary Sewer Lines 27

303.03.03 Connection to Existing Sanitary Sewer Pipe 27

303.03.04 Disconnect and Reconnect Existing Sanitary Sewer Laterals 28

303.03.05 Removal of Existing Pipes, Manholes, and Appurtenances 28

303.03.06 Filling Abandoned Structures 28

303.03.07 Existing Manhole Frames and Covers 28

303.03.08 Permanent Plugs 28

303.03.09 Adjusting Existing Structures to Grade 29

303.03.10 Reconstruct Manhole Base 29

303.03.11 Connect to Existing Structures 29

303.04 Measurement and Payment (Not applicable to privately financed public improvements) 29

303.04.01 New Manholes Over Existing Sanitary Sewer Lines 29

303.04.02 Disconnect and Reconnect Existing Sanitary Sewer Laterals 29

303.04.03 Removal of Existing Pipes, Manholes, and Appurtenances 29

303.04.04 Filling Abandoned Structures 29

303.04.05 Adjusting Existing Structures to Grade 30

303.04.06 Reconstruct Manhole Base 30

303.04.07 Connect to Existing Structures 30

303.04.08 Other Items 30

CHAPTER 400 - STORMWATER TECHNICAL REQUIREMENTS

401 PIPES AND FITTINGS

401.01 Description 1

401.02 Materials 1

401.02.01 General 1

401.02.02 Reinforced Concrete Pipe 1

401.02.03 Ductile Iron Pipe 1

401.02.04 Polyvinyl Chloride (PVC) Pipe 1

401.02.05 High Density Polyethylene (HDPE) Pipe, Solid Wall 1

401.02.06 Polypropylene Dual Wall Pipe 1

401.03 Construction 2
401.03.01 Excavation and Backfill 2
401.03.02 Line and Grade for Gravity Stormwater Lines 2
401.03.03 Pipe Distribution and Handling 2
401.03.04 Pipe Laying and Jointing of Pipes and Fittings 2
401.03.05 Service Connection Markers 2
401.03.06 Closure Collars 2
401.03.07 Testing 3
401.04 Measurement and Payment (Not applicable to privately financed public improvements) 4
401.04.01 Stormwater Pipe 4
401.04.02 Closure Collars 4
401.04.03 Field Fabricated Connections 4

402 MANHOLES, INLETS, AND CONCRETE STRUCTURES

402.01 Description 4
402.02 Materials 4
402.02.01 Base Rock 4
402.02.02 Forms 5
402.02.03 Concrete and Reinforcing Steel 5
402.02.04 Cement Mortar 5
402.02.05 Manholes 5
402.02.06 Pipes and Fittings 5
402.02.07 Precast Inlets and Catch Basins 5
402.02.08 Manhole Frames and Covers 5
402.02.09 Standard Frames and Grates for Inlets and Catch Basins 5
402.02.10 Sedimentation Manhole and Drywell Systems 6
402.02.11 Drop Assemblies 6
402.02.12 Beehive Inlets 6
402.03 Construction 6
402.03.01 General 6
402.03.02 Manholes 7
402.03.03 Pipe Stub-outs from Manholes 7
402.03.04 Manhole Grade Rings 7
402.03.05 Manhole Frames and Covers 7
402.03.06 Vacuum Testing 7
402.03.07 Concrete Encasement 7
402.03.08 Installation of Inlets and Catch Basins 7
402.03.09 Inlet Extensions 7

402.03.10 Manhole Steps 7
402.03.11 Cleaning 8
402.03.12 Sedimentation Manhole and Drywell Systems 8
402.04 Measurement and Payment (Not applicable to privately financed public improvements) 8
402.04.01 Manholes 8
402.04.02 Tamperproof and Watertight Manhole Frames and Covers 8
402.04.03 Concrete Encasement 8
402.04.04 Catch Basins and Inlets 8
402.04.05 Sedimentation Manhole and Drywell Systems 8
402.04.06 Other Items 9

403 WORK ON EXISTING STORMWATER DRAINAGE STRUCTURES

403.01 Description 9
403.02 Materials 9
403.03 Construction 9
403.03.01 Excavation and Backfill 9
403.03.02 New Manholes Over Existing Stormwater Lines 9
403.03.03 Removal of Existing Pipes, Manholes, and Appurtenances 9
403.03.04 Filling Abandoned Structures 9
403.03.05 Existing Manhole Frames and Covers 9
403.03.06 Permanent Plugs 9
403.03.07 Adjusting Existing Structures to Grade 10
403.03.08 Reconstruct Manhole Base 10
403.03.09 Connect to Existing Structures 10
403.03.10 Drywell Protection 10
403.03.11 Sedimentation Manhole and Drywell System Retrofits 10
403.04 Measurement and Payment (Not applicable to privately financed public improvements) 10
403.04.01 New Manholes Over Existing Stormwater Lines 10
403.04.02 Removal of Existing Pipes, Manholes, and Appurtenances 10
403.04.03 Filling Abandoned Structures 10
403.04.04 Adjusting Existing Structures to Grade 10
403.04.05 Reconstruct Manhole Base 11
403.04.06 Connect to Existing Structures 11
403.04.07 Drywell Protection 11
403.04.08 Sedimentation Manhole and Drywell System Retrofits 11
403.04.09 Other Items 11

CHAPTER 500 - WATER TECHNICAL REQUIREMENTS

500 GENERAL **1**

501 PIPES, FITTINGS AND VALVES

501.01 Description **1**
501.02 Materials **1**
501.02.01 Flanged Or Spool Ductile Iron Pipe 1
501.02.02 Push-On Ductile Iron Pipe 2
501.02.03 Polyvinyl Chloride (PVC) Water Pipe 3
501.02.04 Copper Pipe 3
501.02.05 PEXa Pipe 3
501.02.06 Valves 4
501.02.07 Water Line Markers 4
501.02.08 Tracer Wire 4
501.02.09 Polyethylene Encasement 5
501.02.10 Tapping Sleeve And Valve 5
501.03 Construction **5**
501.03.01 Placing And Blocking Pipes And Fittings 5
501.03.02 Polyethylene Encasement Of Pipe And Fittings 6
501.03.03 Placing Valve Units 6
501.03.04 Water Service Line Installation 6
501.03.05 Placing Water Line Markers 8
501.03.06 Tracer Wire 8
501.04 Measurement and Payment (Not applicable for privately financed public improvements) **9**
501.04.01 Installation of Pipe 9
501.04.02 Fittings For Ductile Iron Pipe 9
501.04.03 Water Service Line Installation 9
501.04.04 Sanitary Sewer Crossings 9

502 APPURTENANCES

502.01 Description **10**
502.02 Materials **10**
502.02.01 Fire Hydrant Assembly 10
502.02.02 Blow-Off Units 10
502.02.03 Combination Air Valve Unit 11
502.02.04 Water Quality Sampling Stations 11
502.02.05 Corrosion Control Materials 11
502.02.06 Cast Iron Valve Boxes 12

502.02.07 Meter Boxes And Cover 13
502.02.08 2-Inch Service Saddles 13
502.03 Construction 13
502.03.01 Placing Fire Hydrant Assemblies 13
502.03.02 Placing Permanent Blow-Off Assemblies 14
502.03.03 Placing Combination Air Valve Units 14
502.03.04 Corrosion Control Installation 14
502.03.05 Backflow Prevention Assemblies 16
502.04 Measurement and Payment (Not applicable for privately financed public improvements) 18
502.04.01 Fire Hydrant Assembly 18
502.04.02 Blow-Off Assemblies 18
502.04.03 Combination Air Valve Unit 18
502.04.04 Water Quality Sampling Station 19
502.04.05 Corrosion Control 19

503 WORK ON WATER SYSTEMS

503.01 Description 19
503.02 Construction 19
503.02.01 Storage Of Equipment And Materials 19
503.02.02 Water Line Tapping 19
503.02.03 Removing Existing Water Works Materials 20
503.02.04 Abandoning Existing Mains And Valves 20
503.02.05 Maintaining Service 20
503.02.06 Flushing 20
503.02.07 Pressure Testing 22
503.02.08 Chlorination 23
503.02.09 Cut-In And Connection To Existing Mains 23
503.02.10 Impervious Dams 24
503.03 Measurement and Payment (Not applicable for privately financed public improvements) 24
503.03.01 Cut-In And Connection To Existing Main 24
503.03.02 Water Line Tapping 25
503.03.03 Abandoning Existing Main And Valves 25
503.03.04 Over-Excavation 25
503.03.05 Other Items 25

CHAPTER 600 - TRANSPORTATION TECHNICAL REQUIREMENTS

601 SUBGRADE

601.01 Description 1

601.01.01 Untreated Subgrade 1

601.02 Materials 1

601.02.01 Water 1

601.03 Construction 1

601.03.01 Preparation of Subgrade 1

601.03.02 Grading of Areas Not to be Paved 2

601.03.03 Over-excavation and Foundation Stabilization 2

601.03.04 Embankment Construction 2

601.03.05 Slides and Slip-outs 2

601.03.06 Slopes 2

601.03.07 Finishing and Cleanup 2

601.03.08 Compaction and Density Requirements 2

601.04 Measurement and Payment (Not applicable to privately financed public improvements) 3

601.04.01 Incidental Work 3

601.04.02 Untreated Subgrade 3

601.04.03 Over-excavation and Foundation Stabilization 3

601.04.04 Embankment 3

602 WATERING

602.01 Description 3

602.02 Materials 4

602.02.01 Water 4

602.03 Construction 4

602.04 Measurement and Payment (Not applicable for privately financed public improvements) 4

602.04.01 Water 4

603 AGGREGATE BASES

603.01 Description 4

603.02 Materials 4

603.02.01 Aggregate 4

603.02.02 Sand Equivalent 4

603.02.03 Liquid Limit and Plasticity 4

603.02.04 Grading Requirements 5

603.02.05 Acceptance 5
603.03 Construction 5
603.03.01 Preparation of Subgrade 5
603.03.02 Mixing 5
603.03.03 Placing 5
603.03.04 Compaction 6
603.03.05 Surface Finish 6
603.04 Measurement and Payment (Not applicable to privately financed public improvements) 6
603.04.01 Aggregate Bases 6

604 CEMENT-TREATED BASE

604.01 Description 6
604.02 Materials 7
604.02.01 Aggregate 7
604.02.02 Portland Cement 7
604.02.03 Water 7
604.02.04 Asphalt Materials 7
604.02.05 Mix Design and Certification 7
604.03 Construction 8
604.03.01 Mixture 8
604.03.02 Weather Limitations 8
604.03.03 Equipment 8
604.03.04 Hauling and Placing 9
604.03.05 Thickness and Number of Layers 9
604.03.06 Construction Joints 9
604.03.07 Compaction 10
604.03.08 Surface Finish 10
604.03.09 Bituminous Curing Seal 10
604.03.10 Care of Work 11
604.03.11 Modification of Equipment and Methods 11
604.03.12 Timing of Operations, Adequacy of Organization, and Rejection of Mixture 11
604.03.13 Handling Traffic Over Cement-Treated Base 11
604.03.14 Testing 11
604.04 Measurement And Payment (Not applicable to privately financed public improvements) 12
604.04.01 Cement-Treated Base 12
604.04.02 Bituminous Curing Seal 12

605 ASPHALT CONCRETE PAVEMENT

605.01 Description 12

605.02 Materials 13

605.02.01 General 13

605.02.02 Asphalt Cement 13

605.02.03 Aggregates 13

605.02.04 Mineral Filler 13

605.02.05 Additives 13

605.02.06 Composition and Proportion of Mixtures 13

605.02.07 Mix Formulas 14

605.02.08 Recycled Asphalt Pavement (RAP) Materials Permitted 14

605.02.09 Tolerances 15

605.02.10 Feathering 15

605.03 Construction 15

605.03.01 Pre-paving Conference 15

605.03.02 Preparation of Bases 15

605.03.03 Reconditioning Old Roadbed 16

605.03.04 Tack Coat 16

605.03.05 Mixing 16

605.03.06 Placing 16

605.03.07 Protection of Structures 17

605.03.08 Paving Plant Equipment 17

605.03.09 Weigh Scales 17

605.03.10 Hauling Equipment 17

605.03.11 Asphalt Concrete Pavers 18

605.03.12 Weather Limitations 18

605.03.13 Compaction 18

605.03.14 Compactors 18

605.03.15 Density Requirements 19

605.03.16 Transverse Joints 20

605.03.17 Longitudinal Joints 20

605.03.18 Thickness and Number of Layers 21

605.03.19 Pavement Samples 21

605.03.20 Pavement Smoothness 21

605.03.21 Special Protection Under Traffic 21

605.04 Measurement and Payment (Not applicable to privately financed public improvements) 22
605.04.01 Asphalt Concrete on Ton Basis 22
605.04.02 Asphalt Concrete on Square Yard Basis 22

606 PORTLAND CEMENT CONCRETE PAVEMENT

606.01 Description 23
606.02 Materials 23
606.03 Construction 23
606.03.01 General 23
606.03.02 Preparation of Concrete Mix 23
606.03.03 Hauling 24
606.03.04 Forms 24
606.03.05 Handling and Placing 24
606.03.06 Preparation of Roadway 25
606.03.07 Weather Limitations 25
606.03.08 Slip Form Paving 25
606.03.09 Tamping and Screeding 26
606.03.10 Finishing 26
606.03.11 Joints 27
606.03.12 Tolerances 27
606.03.13 Curing and Protection of Concrete 27
606.04 Measurement and Payment (Not applicable to privately financed public improvements) 27
606.04.01 Portland Cement Concrete Pavement 27

607 CURBS, GUTTERS, DRIVEWAYS, AND SIDEWALKS

607.01 Description 28
607.02 Materials 28
607.02.01 General 28
607.02.02 Portland Cement Concrete 28
607.02.03 Aggregate 28
607.02.04 Wire Fabric Reinforcement 29
607.03 Construction 29
607.03.01 Preparation of Base 29
607.03.02 Forms 29
607.03.03 Equipment 29
607.03.04 Placing Material 30
607.03.05 Finishing 30

607.03.06 Curing Portland Cement Concrete 31
607.03.07 Joints in Portland Cement Concrete 31
607.03.08 Dowels, Tie Bars, and Reinforcing 32
607.04 Measurement and Payment (Not applicable to privately financed public improvement projects) 32
607.04.01 Curbs 32
607.04.02 Combination Curb and Gutter 32
607.04.03 Sidewalks and Pathways 32
607.04.04 Concrete Valley Gutter 32
607.04.05 Median Islands 32
607.04.06 Driveways 33
607.04.07 Sawed Joints 33
607.04.08 Aggregate Base 33

608 GEOTEXTILE FABRICS

608.01 Description 33
608.02 Materials 33
608.03 Construction 33
608.03.01 General 33
608.03.02 Subgrade Geotextile 33
608.03.03 Pavement Overlay Geotextile 33
608.04 Measurement and Payment (Not applicable to privately financed public improvements) 35

609 COLD PLANE PAVEMENT REMOVAL

609.01 Description 35
609.02 Construction 35
609.02.01 Equipment 35
609.02.02 Pavement Removal 35
609.02.03 Surface Tolerance 35
609.02.04 Disposal of Materials 36
609.03 Measurement and Payment (Not applicable to privately financed public improvements) 36

610 ADJUSTMENT OF STRUCTURES TO GRADE

610.01 Description 36
610.02 Materials 36
610.03 Construction 36
610.03.01 General 36

610.03.02 Salvage of Existing Structures 36
610.03.03 Raising Tops of Masonry Structures 37
610.03.04 Lowering Tops of Masonry Structures 37
610.03.05 Adjusting Metal Structures 37
610.04 Measurement and Payment (Not applicable to privately financed public improvements) 37
610.04.01 Adjustment of Structures to Grade 37

STANDARD DETAILS TABLE OF CONTENTS

Drawing Number	GENERAL
201	Standard Manhole for 27” and Lesser Diameter Pipes
202	Standard Manhole for 30” and Larger Diameter Pipes
203	Shallow Manhole for 27” and Lesser Diameter Pipes
204	Cast-in-Place Manhole
205	Standard Manhole Frame
206	Suburban Manhole Frame
207	Waterproof and Tamperproof Manhole Frame
208	Off-road Elevated Frame Assembly (HINGE)
209	Off-road Elevated Frame Assembly (PIN)
210	Manhole Step
211	Standard Cleanout
212	Pipe Anchor Wall
213	Pipe Concrete Encasement
214	Trench and Backfill

Drawing Number	WASTEWATER
301	Standard Inside Drop Manhole
302	Shallow Inside Drop Manhole
303	Standard Wastewater Manhole Cover
304	Wastewater Tamperproof and Waterproof Manhole Cover
305	Wastewater Manhole, Off-road Elevated Cover (HINGE)
306	Wastewater Manhole, Off-road Elevated Cover (PIN)
307	Sanitary Sewer Lateral
308	Tap in Existing Main for Sanitary Sewer Lateral
309	Wastewater Connection, 3 or 4 Lots with Private Easements
310	Joint Detail Reinforced Concrete (T=less than 4 5/8”)
311	Joint Detail Reinforced Concrete (T=4 5/8” and Larger)
312	Typical Joint Detail and Data Form

Drawing Number	STORMWATER
401A	Catch Basin
401B	Catch Basin Section
401C	Catch Basin Frame and Grate
401D	Double Catch Basin
401E	Catch Basin with P-45 Grate
401F	Modified Catch Basin Frame with Single P-45 Grate
402	Non-Grated Catch Basin
403A	Ditch Inlet Type D - 30°
403B	Ditch Inlet Type D - 15°
403C	Ditch Inlet Frame and Grate
404A	Inlet-Manhole Standard
404B	Inlet-Manhole Combination Curb Inlet
404C	Inlet-Manhole Alternate Top
404D	Non-Grated Inlet-Manhole (A)
404E	Non-Grated Inlet-Manhole (B)

404F	Non-Grated Inlet-Manhole (B) Top
405A	Flow Control Manhole
405B	8” Shear Gate and Lift Handle
406	Detention Pipe Typical Closed
407	Drywell System
408	Drywell System and Sedimentation Manhole (Typical Retrofit Installation)
409	Polypropylene Hanging Ladder
410	Standard Stormwater Manhole Cover
411	Stormwater Tamperproof Manhole Cover
412	Stormwater Manhole, Off-road Elevated Cover (HINGE)
413	Stormwater Manhole, Off-road Elevated Cover (PIN)
414	Outfall Protection
415	Sedimentation Manhole

Drawing Number	WATER
501A	Fire Hydrant Assembly
501B	Typical Hydrant Marker Location
501C	Fire Hydrant Clear Zone
502	1” Water Service
503	2” Water Service (1 1/2”-2” Meter)
504	Water Sampling Station
505A	Combination Air Valve Unit
505B	Combination Air Valve Notes
506A	2” Blowoff Assembly
506B	4” or 6” Blowoff Assembly
506C	4” or 6” Temporary Fill Point
507	Horizontal Thrust Blocking
508	Vertical Thrust Blocking
509	Straddle Block
510	Gravity Sanitary Sewer, Water Line Separation
511	“Vancouver” Style Valve Box
512	“Portland” Style Valve Box
513A	3” Through 8” Meter Vault and Piping
513B	3” Through 8” Meter Vault and Piping Specs
513C	3” Through 8” Meter Vault and Piping Notes
513D	Ladder with Aluminum Extension
514A	Double Check Valve or Double Check Valve Detector Assembly Plan View
514B	Double Check Valve or Double Check Valve Detector Assembly Elevation View
514C	Typical Fire Department Connection Installation
514D	3/4” Through 2” Double Check Installation
514E	Abandonment of Lawn Irrigation Backflow Assembly
514F	Reduced Pressure Principle Small Assembly 2 1/2” and Smaller
514G	Reduced Pressure Principle Assembly 3” and Larger
514H	Drainage Route Between Meter and Backflow Vaults
515A	3/4” – 1” Meter Cover
515B	1 1/2” – 2” Meter Cover
516	Typical Commercial/Industrial Service Layout
517	Locate Wire Box

Drawing Number	TRANSPORTATION
601	Typical Utility Placement
602	Public Access Road
603	Alley Street Section
604	Minor Access Street Section
605	Local Street Sections
606	Collector Street Sections
607	Arterial Street Sections
608	Shared Street Section
609	Downtown/Civic Local Street Section
610	Civic Connector Street Section
611	Downtown Main (Powell to 4th) Street Section
612	Downtown Stanley Street Section
613	Roberts (Powell to Regner) Street Section
614	Boulevard
615	Standard Cul-de-sac
616	Branch Turnaround
617	Eyebrow Corner
618	Driveway Approach
619	Curb Return Driveway Approach
620	Monolithic Curb and Gutter
621	Type ‘C’ Curb
622	Mountable Curb
623	Typical Sidewalk
624	Sidewalk Ramp
625	Corner Curb Extension
626	Multi-Use Path / Trail
627	Bollard
628	End of Road Markers
629	End of Sidewalk Marker
630	Street Barricade
631	Standard Signpost
632	Sign Attachment
633	Street Name Signs
634	Standard 8” Monument Box
635	Speed Bump
636	Median Island Signing, Striping and Marking
637	Overlay Notching
638	Manhole Frame Adjustment
639	Trench Pavement Restoration
640	PCC Pavement Restoration
641	Town Center Street Tree
642	Street Tree Planting
643	Fiberglass Streetlight
644	Aluminum Davit Streetlight
645	Decorative Acorn Streetlight
646	Decorative Pendant Streetlight
647	Luminaire Mounted on Wood Pole
648	Electrical Junction Boxes
649	Streetlight Service Disconnect and Conduit System
650	Streetlight Electrical Service Pedestal
651	Signal Communications Conduit

Drawing Number	PARKS
701	Trash Receptacle

Drawing Number	GREEN STREET
GS-101	Planter Plan View
GS-102	Planter Section View
GS-103	Planter Wall and Modified Curb
GS-104	Concrete Curb Inlet
GS-105	Concrete Check Dam
GS-106	Liner Attachment and Pipe Boot
GS-107	Underdrain and Rock Requirements
GS-108	Beehive Overflow
GS-109	Stormwater Facility, Meter and Hydrant Locations
GS-110	Stormwater Facility Residential Driveway Approach
GS-111	Stormwater Tree Well

Public Works Standards

DESIGN STANDARDS

DEPARTMENT OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM, OREGON

CHAPTER 1 - GENERAL DESIGN

1.01 AUTHORITY AND PURPOSE

The City of Gresham has a Gresham Community Development Plan that regulates land use and development issues within the City. This comprehensive planning document consists of five volumes which are periodically amended by the Gresham City Council following a public process. Volume 3, titled *Gresham Community Development Code*, consists of thirteen articles defining separate development standards. Appendix 5.000 – Public Facilities discusses generalized public facility design requirements and requires compliance with the ***Public Works Standards***, which includes the Design Standard, the Standard Specifications and the Standard Details. Chapters One through Seven of the ***Public Works Standards*** shall be known as the Design Standards.

The purpose of these Design Standards is to provide a consistent policy under which certain physical aspects of public facility design shall be implemented. Most of the elements contained in this document are public works oriented and it is intended that they apply to both publicly financed public improvements under City contract and privately financed public improvements under private contract designated herein.

These Design Standards cannot provide for all situations. They are intended to assist but not to substitute for competent work by design professionals. It is expected that engineers will bring to each project the best skills from their respective disciplines.

The Design Standards are also not intended to unreasonably limit any innovative or creative effort that could result in better quality, better cost savings, or both. Any proposed departure from the Design Standards will be judged, however, on the likelihood that such variance will produce a compensating or comparable result to that of the Design Standard.

Alternate materials and methods will be considered for approval by the Engineer as the need arises and conditions warrant modification. This consideration will be on a case-by-case basis and require sufficient justification prior to approval.

1.02 DEFINITIONS

As-Built Plans — Plans signed and dated by the Engineer of Record indicating that the plans have been reviewed and revised, if necessary, to accurately show all as-built construction. Also referred to as record drawings.

Building Sewer — A private wastewater service between the property line or public easement line connecting to the sanitary sewer lateral and a point 5-feet outside the building.

CAD — Computer aided design.

City — The City of Gresham, a municipal corporation of the State of Oregon, and its elected officials, officers, employees, volunteers and agents.

Datum, Horizontal — The horizontal control network of the City was adjusted to the North American Datum 83(91) (NAD83(91)) expressed in Oregon North Zone State Plane Coordinates in international feet.

Datum, Vertical — The vertical elevation control for the City is "The National Geodetic Vertical Datum of 1929" (NAD29) that corresponds to the USC&GS 1947 Datum.

Dead-end Street	A street or series of streets that can be accessed from only one point. Dead-end streets can be either temporary (intended for future extension as part of a future street plan) or permanent.
Demand	The total quantity of water supplied for a given period of time to meet the various required uses. The various uses include residential, irrigation, commercial, and industrial uses as well as firefighting, system losses, and other unaccounted for or miscellaneous uses.
Design Storm	A rainfall event of a specified duration (e.g., 6-hour, 12-hour, 24-hour) and return frequency (e.g., 2-years, 10-years, etc.) that is used to calculate the runoff volume and/or discharge rate to be used for stormwater system design.
Detention	The storage and subsequent release of excess stormwater runoff to control peak discharge rates prior to discharge to the storm drain or natural drainageway.
Detention Volume	The storage volume required to control the peak discharge rates at the point of discharge from a development.
Development	Any human-made change to improved or unimproved real estate, including but not limited to construction, installation, or alteration of buildings or other structures, condominium conversion, land division, establishment or termination of a right of access, storage on real property, tree removal, drilling and site alteration such as land surface mining, dredging, filling, grading, paving, excavation or clearing.
Domestic Wastewater	The liquid and water-borne waste derived from the ordinary living processes, free from industrial wastes, and of such character to permit satisfactory disposal, without special treatment, into the public wastewater system or by means of private wastewater disposal system.
Double Check Valve Detector Assembly	A line-sized, approved double check valve assembly with a parallel meter and meter-sized, approved double check valve assembly. The purpose of this assembly is to provide backflow protection for the distribution system and, at the same time, provide a metering of the fire system showing any system leakage or unauthorized use of water.
Double Check Valve Assembly	An assembly composed of two single, independently acting approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test cocks.
Drainage Facilities	Pipes, ditches, detention basins, creeks, culverts, bridges, etc., used singularly or in combination with each other for the purpose of conveying or storing stormwater runoff.
Drywell	A drainage facility (or system) designed to utilize the infiltration capability of the ground, commonly referred to as percolation, to dispose of surface and stormwater runoff.
Easement	The recorded right that allows others to use a defined area of property for specific purpose(s), such as access or utilities.
Engineer	The applicable City Department of Environmental Services division manager, or designee, who is licensed as a registered professional engineer in the State of Oregon.

Engineer of Record	A registered professional engineer licensed to practice in the State of Oregon who is responsible for the design of a public improvement project and has stamped the plans.
Expansion Joint	A joint to control cracking in the concrete surface structure and is filled with preformed expansion joint filler.
Fire Service Line	A metered connection to the public water main intended only for the extinguishment of fires and the flushing necessary for its proper maintenance.
Grade	The degree of inclination of a road or slope.
Hydrant Lead	The waterline connecting the fire hydrant to the auxiliary valve on the City distribution main.
Impervious Area	Those hard surface areas that either prevent or retard saturation of water into the land surface, as existed under natural conditions pre-existent to development, and cause water to run off the land surface in greater quantities or at an increased rate of flow from that present under natural conditions pre-existent to development.
Industrial Waste	Solid, liquid, or gaseous waste resulting from any industrial, manufacturing, trade, or business process from development, recovery, or processing of natural resources.
Irrigation Service	A metered connection intended for seasonal use and delivering water that is not discharged to the wastewater system.
Longitudinal Joint	A joint, which follows a course approximately parallel to the centerline of the roadway.
Manager	The City Manager of the City of Gresham acting either directly or through authorized representatives.
Natural Grade	The grade of the land in an undisturbed state.
OnSite Detention	The detention of stormwater from a private storm drain in a privately owned and maintained storm drain system to provide a controlled release, at or below a maximum allowable rate, to the public storm drain system.
Outfall	The point at which collected, concentrated stormwater is discharged, generally from a pipe(s), from a development to an open drainage element such as a ditch, channel, swale, stream, river, pond, lake or wetland.
Owner	The owner of record of real property as shown on the latest tax rolls or deed records of the County and includes a person who furnishes evidence that he is purchasing a parcel of property under a written recorded land sale contract.
Partition	To divide land into 2 or 3 parcels of land within a calendar year.
Peak Runoff	The maximum stormwater runoff rate (CFS) determined for the design storm or design rainfall intensity.
Person	Individual, firm, corporation, association, agency, or other entity.

Plans	The Standard Details or reproductions thereof and project specific plans, profiles, cross sections, elevations, details, and other working or supplementary drawings signed by the Engineer of Record that show the location, character, dimensions, and details of the work to be performed. Plans for privately financed public improvement projects must be approved by the Project Manager. Plans for publicly financed public improvement projects may either be bound in the same book as the balance of the Contract Documents or bound in separate sets and are a part of the Contract Documents regardless of the method of binding.
Potable Water	Water that is satisfactory for drinking, culinary, and domestic purposes and meets the requirements of the health authority having jurisdiction.
Private Stormwater Line	A stormwater line located on private property.
Project Manager	The City's representative charged with the management of the project. For publicly financed public improvement projects the Project Manager is typically the Engineer or the Engineer's representative. For privately financed public improvement projects the Project Manager is typically a Development Engineering Specialist of the City.
Projected Maximum Daily Demand	The maximum volume of water anticipated to be delivered to the system in a future single-day of a year divided by 1-day.
Public Stormwater Line	Any stormwater line in public right-of-way or easement operated and maintained by the City.
Public Wastewater System	Any wastewater system in public right-of-way or easement operated and maintained by the City for carrying wastewater and industrial wastes.
Release Rate	The controlled rate of release of drainage, storm, and runoff water from property, storage pond, detention pond, or other facility during and following a storm event.
Retention	The process of collecting and holding surface and stormwater runoff with no surface outflow from a developed property.
Right-of-Way	A general term denoting public land, property, or interest therein acquired for or devoted to a public street or accessway. It includes, but is not limited to, streets, roads, highways, bridges, alleys, sidewalks and all other public ways, including the subsurface under and air space over these areas under the jurisdiction of the City or other public entity.
Roadway	That portion of a street and its appurtenances, typically between curbs or ditches, primarily used for vehicular traffic.
Sedimentation	Deposition of erosional debris soil sediment transported by water.
Sewage	A combination of dirty water and waste matter from residences, business buildings, institutions, and industrial establishments, not including industrial waste.
Sanitary Sewer Lateral	A public wastewater service between the property line or public easement line and the sanitary sewer main line.

Sidewalk	Any paved or unpaved walkway for use by non-vehicular traffic and capable of use by pedestrians. Public sidewalks are located within a public right-of-way, a public access easement, a dedicated public accessway, or the land located between the curb line or outside edge of the pavement of any road, street or highway and the adjacent property line.
Standard Details	Detailed representations of structures, devices, or instructions set forth in the ***Public Works Standards***.
Subdivision	To divide an area or tract of land into 4 or more lots within a calendar year when such area or tract of land existed as a unit or contiguous units of land under a single ownership at the beginning of such year.
Temporary	Any pipe, structure, etc. used during the construction of the project that is removed before the project completion. Any object that is still in place when the project is deemed complete shall be considered permanent.
Transmission Water Main	A water line typically larger than 8 inches in diameter and used to convey water throughout the City with minimal water service line connections.
Transverse Joint	A joint that follows a course approximately perpendicular to the centerline of the roadway.
Trees, Major	Trees that are 30-inches or larger in diameter and are either within the right-of-way or public easement or are within 10-feet of the right-of-way or public easement. Major trees are protected by the City's "Trees First" policy and design modifications of public facilities may be required to accommodate tree preservation. See Resolution 2267.
Trunk Sewer	A wastewater pipe that is primarily intended to receive wastewater from sanitary sewer main lines, other trunk sewers, existing major discharges of raw or inadequately treated wastewater, or water pollution control facilities.
Uniform Plumbing Code	The Uniform Plumbing Code adopted by the International Association of Plumbing and Mechanical Officials (current edition) as revised by the State of Oregon and called the "Oregon Plumbing Specialty Code".
Wastewater	The total fluid flow in the wastewater system that includes industrial waste, sewage, or any other waste (including that which may be combined with any ground water, surface water, or stormwater) that may be discharged into the wastewater system.
Water Distribution System	Water distribution pipelines, pumping stations, reservoirs, valves, and ancillary equipment used to transmit water from the supply source to the service line.
Water Main	The water supply pipe for public use.
Water Service Line	The pipe connection from the City water main to the metering device, hydrant, or fire line backflow prevention assembly.
Wet Weather Season	The period of the year in which the frequency and volume of precipitation is expected to be the greatest. Defined for the purposes of construction and development in the City of Gresham as the period between October 1 and the following May 31.

Wetlands Those lands adjacent to watercourses or isolated therefrom that may normally or periodically be inundated by the waters from the watercourse or the drainage waters from the drainage basin in which it is located. These include swamps, bogs, sinks, marshes, and lakes, all of which are considered to be part of the watercourse and drainage system of the City and shall include the headwater areas where the watercourse first surfaces. They may be, but are not necessarily, characterized by special soils such as peat, muck, and mud.

1.03 ENGINEERING POLICY

It shall be the policy of the City to require compliance with *Oregon Revised Statute 672* for professional engineers.

All engineering plans, reports, or documents shall be prepared by a registered professional engineer or by a subordinate employee under the engineer's direction, and shall be signed by the engineer and stamped with the engineer's seal to indicate the engineer's responsibility for them. It shall be this Engineer of Record's responsibility to review any proposed public facility extension, modification, or other change with the City prior to engineering or other proposed design work to determine any special requirements or whether the proposal is permissible. City comments or approval of the plans, etc., for any job does not in any way relieve the engineer of responsibility to meet all requirements of the City or obligation to protect life, health, and property of the public. The plan for any project shall be revised or supplemented at any time it is determined that the full requirements of the City have not been met.

1.04 APPLICABILITY

These Design Standards shall govern all construction and upgrading of all public and privately financed public facilities in the City and applicable work within its service areas.

1.05 STANDARD SPECIFICATIONS

Except as otherwise provided by these Design Standards, all construction design detail, workmanship, and materials shall be in accordance with the current edition of the City Standard Specifications and Standard Details.

1.06 APPROVAL OF ALTERNATE MATERIALS OR METHODS

Any substitution material or alternate method not explicitly approved herein will be considered for approval as set forth in **Section 1.01**. Persons seeking such approvals shall make application in writing. Approval of any major deviation from these Design Standards shall be in written form. Approval of minor matters shall be made in writing if requested.

Any alternate must meet or exceed the minimum requirements set in these Design Standards.

The written application is to include, but is not limited to, the manufacturer's specifications and testing results, design drawings, calculations, application recommendations and other pertinent information.

Any deviations or special problems shall be reviewed on a case-by-case basis and approved by the Engineer. When requested by the Project Manager, full design calculations shall be submitted for review with the request for approval.

1.07 SPECIAL DESIGN PROBLEMS

Special applications not covered in these Design Standards require review and approval by the City. Submittal of full design calculations, supplemental drawings, and information will be required prior to any approval.

Such applications that may require special review and approval include, but are not limited to, the following:

Energy Dissipaters
Internal Sealing of Existing Sewers
Relining of Existing Sewers
Relining of Existing Water Mains
Sewage Pump Stations
Sewage Treatment Plants
Sewer Flow Measurement/Monitoring Devices
Sewer Force Mains
Sewer Regulatory Devices
Sewer Siphons
Water Distribution Pump Stations
Water Flow Measurement/Monitoring/Telemetry Devices
Water Pressure Regulating Devices
Water Reservoirs
Water Treatment Plants

1.08 REVISIONS TO PUBLIC WORKS STANDARDS

It is anticipated that revisions to these ***Public Works Standards*** will be made from time to time. The date appearing on the title page is the date of the latest revision. Users should apply the latest published revision to the work contemplated.

Parenthetical notations at the bottom of the pages indicate the most recent change to these sections. It shall be the user's responsibility to maintain his/her copy of these ***Public Works Standards*** with the latest changes.

END OF CHAPTER

CHAPTER 2 - GENERAL TECHNICAL DESIGN

2.01 CONSTRUCTION PLAN GENERAL INFORMATION

Prior to any construction work, construction plans, specifications, and all other necessary submittals must be approved by the Project Manager.

2.02 CAD DRAFTING STANDARDS

See the current *City of Gresham CAD Manual*.

2.03 EXISTING CITY AS-BUILT PLANS

City as-built plans are only to be used as an aid to the Engineer of Record. When a conflict occurs, the Engineer of Record shall field locate, or cause to be located, and verify the alignment, depth, and inverts of all existing facilities shown on the plans that will be crossed by the proposed facility.

2.04 SUPPORTING INFORMATION

The Engineer of Record shall submit sufficient supporting information to justify the proposed design. Such information shall include, but not be limited to, the following:

A. Design Calculations

B. For projects proposing to use alternate materials, a design modification must be requested and include specifications and manufacturer's design application recommendations

C. Requirements in **Subsections 2.04.01, 2.04.02 and 2.04.03**.

2.04.01 GEOTECHNICAL REPORT

Provide a Geotechnical Report for projects which include any of the following:

A. Grading of 50 cubic yards or greater,

B. Construction of public roadways,

C. Construction of stormwater facilities.

The Geotechnical Report shall include:

A. Data regarding the nature, distribution, strength and erodibility of existing soils;

B. Conclusions and recommendations for grading procedures and design criteria for corrective measures where necessary;

C. Opinions and recommendations covering adequacy of site to be developed by the proposed grading; and

D. For sites where infiltration will be utilized, the results of soil testing methods as specified in the *Stormwater Management Manual*.

2.04.02 STORMWATER REPORT

Sites including stormwater facilities must provide a Stormwater Report in accordance with *Stormwater Management Manual Section 2.4.4*.

2.04.03 STORMWATER FACILITY OPERATIONS AND MAINTENANCE PLAN

An operations and maintenance plan shall be submitted per the *Stormwater Management Manual*.

2.05 PLAN SUBMITTAL

Construction plans for all privately financed public improvements shall be submitted to the Project Manager. The Project Manager will coordinate the plan review and approval of all construction plans. This review will include verification for compliance with all conditions of approval from the affiliated development permit, ***Public Works Standards***, the Gresham Community Development Plan, City Code, Resolutions, Ordinances, and any applicable master plans.

All plan submittals shall include information required in the current *City of Gresham CAD Manual* along with all other information requested by the Project Manager. This information is to include, but not be limited to, construction cost estimates, easement documents, right-of-way dedications, executed agreements, and a plan check and inspection fee. All submittals will be reviewed for completeness and the applicant or applicant's representative notified if required information is missing. Submittals should be made in a timely manner as lack of information to the City may impede the review process.

Obtaining permits from outside agencies is the responsibility of the applicant. These agencies include, but are not limited to, the Department of Environmental Quality, the National Marine Fisheries Service, the Division of State Lands, the Army Corps of Engineers, and the Oregon Department of Fish and Wildlife.

2.06 AS-BUILT PLAN REQUIREMENTS

For all public works improvements, the Engineer of Record shall submit certified as-built plans for all plan sheets that were approved for construction, including title and detail sheets, within 3-months of the completion of construction. As-built plans shall meet the requirements of the current *City of Gresham CAD Manual* and be graphically and mathematically correct.

The Engineer of Record shall be responsible for as-built surveying of the project to incorporate information including, but not limited to, manhole locations, depths of pipes at manholes, and distances from ends of sewer laterals to each of its side-lot property lines at right-of-way for inclusion in as-built plans; and shall submit, along with the as-built plans, a statement certifying that all work for which plans were approved has been completed in accordance with the ***Public Works Standards***.

The words "As-built Plan" shall appear as the last entry in the revision block along with the month, day, and year the as-built plan was prepared.

2.07 EASEMENTS

2.07.01 GENERAL UTILITY EASEMENTS (GUE)

An 8-foot wide general utility easement shall be provided in accordance with *GCDC 9.0301* requirements. A general utility easement may be used for City purposes and by utilities with franchise agreements and utility licenses in the City.

2.07.02 PUBLIC UTILITY EASEMENTS

When the Engineer determines it is impractical to locate City utilities in rights-of-way, the utilities shall be placed in a public utility easement. All public utility easements granted to the City shall be perpetual easements. All easements must be furnished to the Engineer for review and approval prior to recording and the start of construction.

All easements for the benefit of the City shall be exclusive of all other (non-City) utilities unless otherwise approved by the Engineer.

The easement shall not be used for any purpose that would interfere with the unrestricted operation and maintenance of the utility. Under no circumstances shall a building or any other structure be placed over a utility or utility easement. This shall include overhanging structures with footings located outside the easement. Easements with cross slopes over 5% or grade over 10% shall be explicitly approved by the Project Manager.

Easement locations for public utility facilities serving a planned development, apartment complex, or commercial or industrial development shall be in parking lots, private drives, or similar open areas that will permit an unobstructed vehicle access for maintenance.

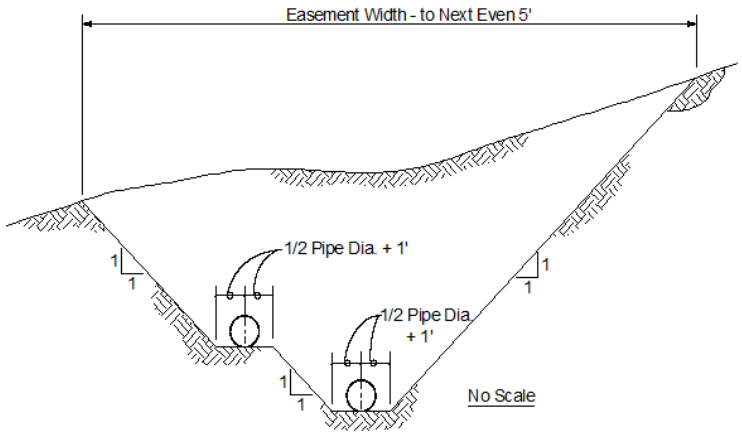
If a public utility access easement is necessary, the minimum width shall be 20-feet.

Except with approval of the Engineer, easements shall be placed on a single property, not centered on property lines, and the utility shall be centered in the easement. If an easement centered along a property line is approved by the Project Manager, the utility shall be offset 18-inches from the property line.

Easement location, purpose, width, and description shall be shown on the plans.

Minimum width of a public utility easement shall be 20-feet. Easement width shall be determined by multiplying the vertical distance from the pipe invert to the ground surface by 2, then adding the nominal pipe diameter plus 2-feet. Easement width shall be rounded upward to even 5-foot increments, but in no case shall be less than 20-feet. In areas of steep (15% slope or greater) or unusual topography, a wider easement may be required as determined by the Engineer.

For multiple utilities to be located within the same easement, the same above rules apply except that the separation of the utilities, both horizontally and vertically, must be considered. Utilities must have at least a 1-foot horizontal separation of the outside surfaces, including bells. For multiple utilities at differing elevations, the horizontal separation and easement width is determined as shown below:



Open channels shall have easements sufficient in width to cover the 100-year floodplain line when a 100-year design storm is required, or 15-feet from the waterway centerline, or 10-feet from the top of the recognized bank, or such a distance that is required by the Habitat Conservation Area (HCA) Overlay, whichever is greater. Standards relating to the HCA are found in *Section 5.0400* of the

Gresham Community Development Code. In addition, a 20-foot wide access easement shall be provided on both sides of the channel for channel widths greater than 14-feet at the top of the recognized bank.

Any Gresham water main placed within an easement will be permanently marked with blue plastic markers at all angle points, and no less than every 200-feet, or at a change in direction. In addition, markers shall be placed where the waterline intersects the public right-of-way at the easement location. A monument cap set in the pavement of parking lots, driveways, etc. shall be an acceptable alternative to the blue plastic marker.

2.08 DEPTHS OF BURY FOR PIPES

The depth of bury table shown below is based on design methodology for each material type. To develop this table, numerous assumptions were required for each pipe material. In general, when assumptions were required, the values that would provide more conservative results were selected.

Table 2.08 DEPTHS OF BURY

PIPE MATERIAL	MINIMUM DEPTH	MAXIMUM DEPTH	ALLOWABLE FOR WASTEWATER	ALLOWABLE FOR STORMWATER	ALLOWABLE FOR WATER
D3034 SDR-35 PVC	3 ft	20 ft	X	X	
AWWA C900/C905 PVC	2 ft	35 ft	X	X	
AWWA C909 PVC	1 ft	20 ft			X
HDPE Solid Wall, SDR-17	1 ft	25 ft	X	X	
HDPE Solid Wall, SDR-26	3 ft	20 ft	X	X	
Polypropylene, Dual Wall	2 ft	20 ft		X	
Reinforced Concrete C76, Class III (8”-10”)	1 ft	8 ft	X		
Reinforced Concrete C76, Class III (12”-84”)	1 ft	10 ft	X	X	
Reinforced Concrete C76, Class V (8”-10”)	1 ft	19 ft	X		
Reinforced Concrete C76, Class V (12”-84”)	1 ft	22 ft	X	X	
Ductile Iron, Class 52	2.5 ft	35 ft	X	X	X

The minimum depth values shown in this table are based on the characteristic properties of the pipe material. The City requirements for minimum depth can be found in **Subsections 3.03.02 (Wastewater), 4.03.02 (Stormwater) and 5.02.02 (Water)**.

2.09 PRIVATE UTILITIES IN RIGHTS-OF-WAY

All private utilities in City rights-of-way shall obtain the appropriate license and/or permit(s) for the work being performed based on *GRC Articles 6.30 and 6.35*. Utility location shall conform to **Standard Detail 601, Typical Utility Placement**, unless otherwise approved by the City. Facilities shall be constructed, installed, operated and maintained in accordance with all applicable federal, state and local codes, rules and regulations, including the National Electrical Code and the National Electrical Safety Code.

A. Replacement utility poles shall not exceed the height of the pole being replaced by more than 15 feet, including the height of utility facilities, except to the extent the additional height is necessary to provide clearance required by applicable electrical codes.

B. A non-wood replacement utility pole shall have a finish of non-reflective grey, brown, weathered steel or other finish approved by the Manager that best matches the nearest five utility poles along the same pole line.

C. The replacement utility pole shall be located to allow the maximum available width for a pedestrian access route, which in no case shall be less than a five-foot clearance or the sidewalk width as defined in **Subsection 6.04.01**, whichever is greater.

D. Replacement utility poles must be located as to physically support the same span of utility lines as the utility pole being replaced. Upon installation of the replacement utility pole, the utility pole being replaced shall be completely removed from the public right-of-way.

E. Utility facilities may be installed on the top of the utility pole but shall not extend more than 10 feet higher than the utility pole, except to the extent the additional height is necessary to provide clearance required by applicable electrical codes.

F. Utility pole appurtenances installed on the side of the utility pole or pole extension shall not extend higher than the top of the utility pole or such pole extension, except to the extent the additional height is necessary to provide clearance required by applicable electrical codes.

G. Antennas, mounting hardware, conduit, cabling, and other equipment installed on the utility pole shall have a non-reflective surface treatment to best match the color of the utility pole, except to the extent regulated by NESC.

H. All cables and wiring shall be covered by conduits and cabinets to the extent that it is technically feasible, if allowed by the pole owner. The number of conduits shall be minimized to the number technically necessary to accommodate the facility being served.

I. Antennas and antenna equipment, including but not limited to ancillary equipment, radios, cables, associated shrouding, disconnect boxes, meters, microwaves, and conduit, which are mounted on poles, shall be mounted as close to the pole as technically feasible from the surface of the utility pole. Additional distance is allowed, if needed, for pole owner requirements or effective operation of the facility.

J. Antenna and equipment on a utility pole shall have at least a 14-foot vertical clearance from the ground.

K. No lighting of a utility facility is allowed except as required by the Federal Aviation Administration or when lighting is the primary purpose of the utility facility, such as streetlights and traffic signals.

L. Noise generating equipment will meet the requirements of *Gresham Revised Code Article 7.20, Gresham Noise Control Code*.

M. No audible or visible alarms are allowed.

N. Utility facilities in the public right-of-way, which are not placed on or beneath the ground surface, shall only be installed on a utility pole.

O. Utility pole appurtenances on an individual utility pole shall not exceed five, in number, or a total of 20 cubic feet in volume excluding electric meters and telecommunication demarcation boxes, and linear pole attachments such as conduit, cables, wires and other similar facilities.

END OF CHAPTER

CHAPTER 3 - WASTEWATER SYSTEM DESIGN

3.01 GENERAL DESIGN REQUIREMENTS

Wastewater system design shall meet the policies and guidelines of the latest wastewater master plan and its updates. Designs shall also comply with applicable sections of the Oregon Department of Environmental Quality sewer design guidelines, *Oregon Administrative Rule (OAR) 340, Division 52*.

Wastewater systems shall be designed to provide gravity service to all areas of development, including the upper reaches of wastewater drainage basins. Attention shall be paid to ensure all lots on the low side of the street can be served by gravity.

Wastewater system capacity shall be designed for ultimate development density of the contributing area. The system shall allow for future system extension and for future development of the specific drainage area or basin based on current and on proposed land use designations.

Wastewater systems shall be designed to remove the domestic wastewater and industrial wastes from basements of houses, commercial or industrial buildings, and all public and private establishments, where possible. The overflow drains and filter backwash lines of swimming pools and hot tubs shall also drain into a wastewater system.

Stormwater, including but not limited to street, roof, or footing drainage, shall not be discharged into the wastewater system but shall be removed by a system of storm drains or by some other method separate from the wastewater system. Additionally, unpolluted or non-contact cooling waters shall not be discharged into wastewater systems.

As a condition of wastewater service, all developments will be required to provide public wastewater systems to adjacent upstream parcels in order to provide for an orderly development of the drainage area. This shall include the extension of wastewater mains in easements across the property to adjoining properties, and across and along the street frontage of the property to adjoining properties when the main is located in the street right-of-way. This shall include trunk sewer lines that are sized to provide capacity for upstream development.

All public wastewater systems shall be located within the public right-of-way whenever possible. Under special topographical conditions, the placing of public wastewater systems outside of public right-of-way within a public wastewater easement may be approved by the Engineer.

For any project requiring construction within or adjacent to watercourses and/or wetlands, in addition to approval by the City, permits from the appropriate responsible agencies (Oregon Department of Fish and Wildlife, Oregon Division of State Lands, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, etc.) shall be obtained. Copies thereof, or written evidence that no permit is required, shall be given to the City prior to any clearing or construction.

3.02 MINIMUM DESIGN CRITERIA

Design Values – If there are no specific project values for the quantity of sewage to be generated for a project in a day (based on Uniform Plumbing Code flows), the following design values shall be used:

Table 3.02-1 DESIGN VALUES			
LAND USE DESIGNATION	**NET DENSITY (Dwelling Units/Acre)**	**NET POPULATION (People per Acre)**	**DAILY WASTEWATER FLOW (Gallons/Day/Acre)**
Residential Land Use Districts			
LDR-5	8.71	19.2	1,533
LDR-7	6.22	13.7	1,095
TLDR	20.00	44.0	3,520
TR	18.15	39.9	3,194
MDR-12	12.10	26.6	2,130
MDR-24	24.20	53.2	4,259
OFR	12.10	26.6	2,130
Gresham Butte Overlay	1.00	2.2	176
Industrial Land Use Districts			
HI & GI	2.18	4.8	384
Commercial District			
NC	4.36	9.6	767
Corridor Districts			
RTC, CC & MC	40.00	88.0	7,040
SC & SC-RJ	60.00	132.0	10,560
CMF & CMU	24.00	52.8	4,224
Downtown Districts			
DCC, DMU, DTM, DEM, DRL-2 & DCL	60.00	132.0	10,560
DRL-1	12.45	27.4	2,191
Civic Neighborhood			
TDM-C, TDHC, & HDR- C	60.00	132.0	10,560
MDR-C	30.00	66.0	5,280
Pleasant Valley Plan District			
LDR-PV	7.9	17.4	1,390
MDR-PV	20	44.0	3,520
HDR-PV	30	66.0	5,280
HDR-PV in TC	40	88.0	7,040
TC-PV, NC-PV, & MUE-PV	60	132.0	10,560
EC-PV	2.18	4.8	384
Springwater Plan District			
VLDR-SW	3.6	7.9	634
LDR-SW	7.3	16.1	1,285
THR-SW	17.4	38.3	3,062
VC-SW	60	132.0	10,560
RTI-SW & IND-SW	2.18	4.8	384

In addition to the daily wastewater flows in this table, an allowance of 1,000-gallons/day/acre shall be added for all the land area in the basin being served to account for inflow and infiltration (I & I).

The wastewater design flow in gallons per day (gpd) is calculated as: Acres * (1,000 + DWF * 3.0) where DWF = Daily Wastewater Flow in gpd/acre from the table above and 3.0 is the peaking factor. This is also the peak instantaneous flow for purposes of wastewater pump station design, unless otherwise approved by the Engineer.

Velocity – All wastewater pipes shall be designed at a grade that produces a mean velocity of the wastewater design flow of no less than 2-feet per second and not more than 15-feet per second. If topography requires a grade that would result in a velocity greater than 15-feet per second in one pipe section, additional drop manholes shall be installed as required by the Engineer.

The velocity shall be calculated using the wastewater design flow for the basin to be served now and at ultimate design flow in the future.

Size – The pipe size shall be based on the minimum size needed for the design flow and not the size needed to result in a desired slope. The pipe size shall be determined by using one-half of the maximum gravity flow capacity of the pipe for pipes 15-inches in diameter and less, and shall be two-thirds for pipes larger than 15-inches in diameter.

Manning's Equation – When calculating volumes, slopes, and velocities, the Engineer of Record shall use the Manning pipe friction formula.

$$V = \frac{1.486\, R^{\left(\frac{2}{3}\right)} \sqrt{S}}{n}$$

Where: V = Q/A = 2 ft./second minimum
n = Manning's roughness coefficient (0.013 minimum)
R = Hydraulic Radius, ft
S = Slope, ft/ft

Minimum Slope – The following table of minimum pipe slopes shall be used for informational purposes only. The actual slopes shall be determined by the calculated wastewater design flow.

Table 3.02-2 MINIMUM SLOPE

PIPE SIZE (Inches)	SLOPE (Feet/Feet)
8	0.00334
10	0.00248
12	0.00195
15	0.00145
18	0.00114
21	0.00093
24	0.00078
27	0.00066
30	0.00058
36	0.00045
42	0.00037
48	0.00031
54	0.00027
60	0.00023
66	0.00020
72	0.00018

Pipes with slopes of 20% or more, while having to conform to the maximum velocity requirements specified above, are required to have anchor walls as shown in **Standard Detail 212, Pipe Anchor Wall.**

3.03 ALIGNMENT AND COVER

Curved alignments in wastewater systems, vertically or horizontally, are not permitted.

3.03.01 RIGHT-OF-WAY LOCATION

Wastewater systems shall be located in the street right-of-way, where possible. Wastewater lines shall be located 5-feet north or west of the right-of-way centerline. If streets have curved alignments, the center of the manhole structure shall not be less than 6-feet from the curb face.

3.03.02 MINIMUM DEPTH

Whenever possible the sewer lateral shall have 6-feet of cover (measured from the top of the pipe to the finished grade) at the back of the general utility easement, when one exists, or at the property line.

The minimum depth of bury shall be 3 feet. City approval is required when minimum cover requirements cannot be met. C900, C905, or ductile iron pipe shall be used in accordance with **Section 3.04** when cover is less than 3-feet from finished grade.

3.03.03 MAXIMUM DEPTH

The maximum depth of bury shall conform to the requirements shown in **Section 2.08**.

3.03.04 EASEMENTS

Easements shall meet the requirements of **Subsection 2.07.02***.*

3.03.05 SEPARATION WITH UTILITIES

In all instances, the distance between utilities shall be measured surface to surface. Separation between wastewater lines and water lines shall be in accordance with **Standard Detail 510, Gravity Sanitary Sewer, Water Line Separation**. Exceptions shall first be approved by the Engineer.

Where wastewater pipes are being designed for installation parallel with other public or private utilities, the vertical separation shall be 12-inches or in such a manner that will permit future side connections of mains, or services, and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the wastewater pipe. Where crossing of utilities, other than water mains, is required, the minimum vertical clearance shall be 6-inches.

3.03.06 RELATION TO WATERCOURSES

Wastewater lines located along or parallel to streams shall be located outside of the streambed and sufficiently removed therefrom to provide for future, possible stream channel widening. All manhole covers at or below the 100-year flood elevation shall be watertight.

Generally, the top of all wastewater pipes crossing, or adjacent to streams shall be at a sufficient depth below the natural bottom of the streambed to protect the line. Wastewater lines crossing streams or drainage channels shall be designed to cross the stream as nearly perpendicular to the stream channel as possible. The pipe material shall be continuous high-density polyethylene ASTM F714 and D3035.

Concrete encasement per **Standard Detail 213, Pipe Concrete Encasement** will be required when minimum cover requirements cannot be met. Each deviation from the above requirements will be reviewed by the Engineer on a case-by-case basis.

3.04 PIPE MATERIALS AND SIZE

All public wastewater systems shall be constructed with ASTM D3034, SDR-35 PVC pipe as specified in **Section 301** of the Standard Specifications. Where required, for added strength or pressure systems, AWWA C900 PVC or AWWA C905 PVC shall be used. ASTM C76 reinforced concrete pipe, Class III minimum, shall be used where added strength is required and Class 52 ductile iron pipe will be used when added strength is needed and pipe wall thickness is limited.

Solid wall high-density polyethylene (HDPE) pipe may be used in boring, jacking, pipe bursting, and other similar applications when approved by the Engineer. Private sanitary sewer lines shall meet the appropriate sections of the Uniform Plumbing Code.

All public sanitary sewer main lines shall be a minimum diameter of 8-inches.

3.05 STRUCTURES

3.05.01 ACCESS

Access to manholes and vaults, not located in a public roadway, shall be provided within 12 feet of the edge of a vehicular access, measured from center of structure lid, when designed to be accessed perpendicularly by the maintenance vehicle and within 6 feet when designed to be accessed from the front of the maintenance vehicle. Structures may be farther from the edge of the roadway if a public access road is provided that allows for maintenance trucks to get within the appropriate distances specified above, see **Standard Detail 620, Public Access Road**.

3.05.02 MANHOLES

Manholes shall be located at all changes in pipe slope, alignment, size, type, and at all pipe junctions with existing or future wastewater lines excluding 4-inch or 6-inch sanitary sewer laterals.

Manhole spacing shall not be greater than 500-feet.

New designs or revisions to Standard Details should not be shown on the construction drawings unless the standard designs are not suitable. New or revised designs may be necessary if:

A. One or more of the sanitary sewer lines to be connected to the manhole is over 27-inches in diameter

B. Several sanitary sewer lines will be connected to the manhole

C. There is less than 90º between the incoming and outgoing sanitary sewer line

D. The manhole will be subject to unusual structural loads

E. Diversion or other flow control measures are required

Where one or more of conditions A, B, or C are encountered, a drawing of the manhole base shall be drafted to determine if it is feasible to use designs shown in the Standard Details. It may be necessary for the Engineer of Record to restrict the manhole options to a specific Standard Detail specified by a note on the construction drawings. If a special design is required for any reason, it will be necessary to show that design on the construction drawings and to provide the Project Manager with structural calculations.

Some alternate manhole features are shown in the Standard Details. Where these features are required, they must be specified by a note on the construction drawings. Some examples are:

A. Slab tops must be used in lieu of cones where there will be less than 4-feet between the top of pipe and the top of the manhole lid.

B. Watertight manhole frames and covers are to be used if floodwaters are expected to cover the manhole top or if the manhole must be located in the street gutter. Such conditions should be avoided wherever feasible.

C. Tamperproof manhole frames (7-inch depth) and covers are required in all areas outside the paved public right-of-way.

Standards for elevation differences at manholes have been established to compensate for normal energy losses and to prevent surcharging of the wastewater system. For purposes of slope calculation and for establishing elevation differences, the elevations are given at the theoretical horizontal intersection of the wastewater centerlines (usually the center of the manhole). The rules for elevation differences at manholes are:

A. The crowns of incoming pipes shall be at least as high as the crown of the outgoing pipe.

B. If the incoming and outgoing pipes are of equal size and are passing straight through the manhole, no added elevation change is required.

C. If the pipe alignment changes at the manhole, the invert elevation difference shall be at least 0.10-feet for 0° – 45° of horizontal deflection angle, and 0.20-feet for 45° – 90º of horizontal deflection angle. Horizontal deflection angles of greater than 90º are not allowed.

D. Drop connections are required when the vertical distance between flow-lines exceeds 2-feet.

E. All connections must enter the manhole through a channel in the base. This includes drop connections and connections to existing manholes.

Where conditions make compliance with these rules impractical, exceptions may be permitted by the Engineer. It will be necessary, however, for the Engineer of Record to provide a complete analysis of the need for such designs.

3.05.03 CLEANOUTS

Cleanouts will not be approved as substitutes for manholes on public wastewater lines.

Cleanouts are permitted at the end of a non-extendable sewer line that does not exceed 250-feet in length nor serve more than 8 residential units and wastewater lines designed to be extended during a future phase of construction. If future extension requires a change in pipe slope, alignment, size, or type, a manhole will be required at the cleanout location.

3.06 SANITARY SEWER LATERALS

Each individual building lot shall typically be connected by a single, separate, private, sanitary sewer lateral connected to the public wastewater system. Individual sanitary sewer laterals shall be located no closer than 10-feet to the side property line. Combined (Siamese) sanitary sewer laterals are not allowed.

The minimum nominal diameter of a sewer lateral shall be 4-inches. In all cases the sewer lateral shall be equal to or greater than the building sewer diameter. Sewer laterals shall be built to the same construction standards and of the same materials as the wastewater main line. Sewer laterals, in general, shall be placed at 90º to the wastewater main line. Angles other than 90º (45º minimum) may be

approved by the Engineer for cul-de-sac lots. Sewer lateral connections may be made at manholes if such placement would not interfere with other existing or future connections to the manhole.

The minimum slope of sewer laterals shall be 2% unless approved by the Engineer. The maximum slope shall be 100% (45º). Connections to deep wastewater main lines shall be made with risers. See **Standard Detail 307, Sanitary Sewer Lateral**. Alternately, drop connections into manholes must be used where sewer lateral slopes would exceed 100%.

3.07 CONNECTION TO EXISTING SEWERS

When connections are made to existing sanitary sewer main lines, taps will be required per **Standard Detail 308, Taps in Existing Main for sanitary Sewer Lateral** or the connection will need to be made at a manhole. Other connection, such as cut-in tees, will only be permitted with approval by the Engineer.

Connections to existing manholes shall be made with the following guidelines:

A. Where the invert of the connecting pipe is 2-feet or less above the invert of the outgoing pipe, the sewage entering the manhole shall follow a smooth concrete channel transitioning evenly from the invert of the inlet pipe into the main channel. Sewage will not be allowed to fall freely to the manhole base.

B. Where the invert of the connecting pipe is more than 2-feet above the invert of the outgoing pipe, an inside drop per **Standard Detail 301, Standard Inside Drop Manhole** will be required for pipes 15-inches and smaller. Drops for larger pipes will not be allowed. Wastewater entering the manhole shall follow a smooth concrete channel transition from the bottom of the drop into the main channel.

C. Where the invert is required to enter below the existing shelf of the manhole, the shelf shall be removed and replaced with a smooth channel transitioning from the inlet pipe to the main channel. The base of the manhole will be rebuilt if damaged in this process.

D. No pipe will enter an existing manhole where the angle between the incoming flow and the outgoing flow is less than 90°.

3.08 PRIVATE SEWER LINES

Private sewer lines shall be installed on private property in accordance with the requirements of the Uniform Plumbing Code.

Easements for private sewer lines are the responsibility of the owners; but copies of the recorded easements must be given to the Project Manager prior to any construction.

Private sewer lines are not permitted within the public right-of-way.

3.09 SUBSURFACE DISPOSAL

Subsurface wastewater disposal is permitted only when connection to a public wastewater system is not practical per the criteria found in *A5.105 of the Gresham Community Development Code*. Contact the City of Portland, as the responsible regulatory body, for questions and permits for subsurface disposal within the Multnomah County area.

3.10 WASTEWATER PUMP STATION DESIGN STANDARDS

3.10.01 GENERAL

The pump station shall be a submersible pump-type facility and shall generally conform to the plans and specifications for the City of Gresham Wastewater Pump Station. A copy of these documents may be obtained from the City's Wastewater Division. In addition, the design shall meet or exceed the minimum requirements of the Oregon Department of Environmental Quality (DEQ) as established in *OAR 340, Division 52*, and as presented in the DEQ publication "Oregon Standards for Design and Construction of Wastewater Pump Stations". Where conflicts exist between the ***Public Works Standards*** and the aforementioned documents, or any other technical specifications identified therein, the most stringent requirements shall take precedence.

The pump station wet well shall be considered a hazardous location.

The station shall include: Submersible pumps, wet well, valve vault, associated piping and valves, electrical controls, instrumentation, telemetry**,** access road, fencing, landscaping, and potable water supply.

3.10.02 DESIGN

Capacity - Pump station shall be designed to pump the peak instantaneous flow from the service area. When the service area is not built-out, staging of pump station capacity may be allowed.

Standby Power - At a minimum, a connection for an external power source must be provided. Where the flow is substantial or where environmental damage may occur due to power failure, the Engineer may require permanent standby power.

Code Authority - Pump station, and related facilities, will be constructed in conformance with Oregon Plumbing Specialty Code, as adopted by *OAR Chapter 918*, as amended or revised by the State of Oregon and except as modified by *Gresham Revised Code*.

Fabricated Steel Surface Finish - Steel fabrications shall be 304 stainless steel or hot dipped galvanized. Corrosion resistant painting shall be required on valves, piping, and pipe fittings or other items not capable of being galvanized.

Operating and Maintenance Data - Prepare an operation and maintenance (O&M) manual including all product data and related information necessary for the City's operation and maintenance of all products and systems provided with the pump station.

The O&M manual shall conform to the guidelines as set forth in the Oregon DEQ publication "Guidelines for Writing Pump Station O&M Manuals".

Spare Parts - Supply two sets each of all gaskets, bearings, and mechanical seals for rotating equipment.

Calculations Required - Service area, peak instantaneous flow, and pump station calculations shall be submitted to the Project Manager.

Storage Volume - Wet well shall be designed to provide 1-hour peak instantaneous flow storage above high water alarm elevation.

3.10.03 KEY COMPONENTS

Pumps - A minimum of 2 pumps shall be supplied. Each pump shall be capable of pumping the peak instantaneous flow. Where more than 2 pumps are used, the station shall be able to pump peak instantaneous flow when the largest pump is out of service.

Pumps shall be submersible pumps manufactured by FLYGT (or approved equal), explosion-proof, suitable for hazardous location, capable of passing solids and shall be UL or Force Main (FM) listed.

Piping and Valves - Piping and valves shall be in accordance with DEQ publication "Oregon Standards for Design and Construction of Wastewater Pump Stations".

Electrical - Electrical controls shall be located above ground, mounted in a waterproof enclosure. Electrical panels shall be UL listed.

Controls - Pump stations shall utilize a Programmable Logic Controller (PLC) based control system. An ultrasonic level transducer shall control pump operation and alarms.

A redundant float activated circuit shall provide a fail-safe, high-water alarm system. The Engineer shall provide the brand and model of the programmable logic controller, as well as other devices, in order to ensure compatibility with the existing system.

Control system design shall be subject to the approval of the Engineer.

Alarms and Telemetry - Alarms shall be telemetered to the City of Gresham Wastewater Treatment Plant. Telemetry shall conform to specifications and requirements provided by the Engineer to ensure compatibility with existing systems. Alarms are required for pump failure, power failure, high water, and telemetry failure.

Landscaping – Provide landscaping as required by the City.

Fencing – For fencing requirements refer to plans and specifications for the City of Gresham Wastewater Pump Station. A copy of these documents may be obtained from the City's Wastewater Division.

Additional Features - Provide 1-inch hose bib at valve vault.

Provide potable water by reduced pressure backflow prevention assembly.

Provide positive ventilation in valve vault.

Provide odor control systems as required by the City.

Force Main - Force main shall be designed for a nominal flow velocity in the range of 3-feet to 5-feet per second, shall be a minimum of 4-inches in diameter and shall be constructed of solid wall HDPE with welded connections.

END OF CHAPTER

CHAPTER 4 - STORMWATER DRAINAGE SYSTEM DESIGN

4.01 GENERAL DESIGN REQUIREMENTS

Stormwater design within a development must include provisions to adequately control runoff from all public and private streets, all impervious surfaces to be constructed on the site. The design must ensure future extension of the stormwater drainage system to the entire drainage basin in conformance with the adopted City of Gresham Stormwater Master Plans, *Stormwater Management Manual (SWMM)* and Design Standards.

Surface or subsurface drainage, caused or affected by the changing of the natural grade of the existing ground, removal of natural ground cover or placement of impervious surfaces, shall not be allowed to flow over adjacent public or private property in a volume or location materially different from that which existed before development occurred. Instead, the drainage shall be collected and conveyed in an approved manner to an approved point of disposal.

Surface water entering the subject property shall be received at the naturally occurring locations. Surface water exiting the subject property shall be discharged at the naturally occurring locations with adequate energy dissipaters within the subject property to minimize downstream damage.

The approved point of disposal for all stormwater may be a stormwater line, existing open channel, creek, detention pond or retention pond. If approved by the Engineer, a vegetated or non-vegetated infiltration facility may be an approved point of disposal. Acceptance of proposed systems will depend upon the prevailing site conditions, capacity of existing downstream facilities, environmental regulatory requirements, and feasibility of the design.

When adjacent private property must be crossed to reach an approved point of disposal, it shall be the developer's responsibility to acquire a recorded private drainage easement (of dimensions in accordance with **Subsection 2.07.02**). The drainage facility installed must be a piped system. Temporary drainage ditch facilities, when approved, must be engineered to contain the stormwater without causing erosion or other adverse effects to the adjacent private property.

The peak runoff from the subject property, for all applicable design storms, may not be increased from conditions existing prior to any development. Retention and/or detention facilities will be required, where necessary, to meet this requirement. Additional flow control requirements, as stated in the *Stormwater Management Manual* and adopted Stormwater Master Plan, must also be met as applicable.

Drainage from roofs, footings, downspouts, and side yard swales may only drain directly to a street through the curb when on site disposal is not practicable, and the following conditions are met:

A. The building pad ground elevation is at least 2-feet above the existing street curb, and

B. The existing street is adequately crowned to avoid sheet flow across the street. This requirement may be waived for conditions such as narrow streets.

Vegetation shall be established on areas disturbed or on areas of construction, as necessary, to minimize erosion in accordance with the City's *Erosion Prevention and Sediment Control Manual*.

Stormwater facilities will be required to control the discharge of pollutants from development to the municipal stormwater drainage system or natural watercourse according to the *Stormwater Management Manual*.

All stormwater drainage system designs shall make adequate provisions for collecting all stormwater runoff. The system shall accommodate all runoff from upstream tributary areas whether or not such areas are within the proposed development. The amount of runoff to be accommodated shall be based upon ultimate development of all upstream tributary areas.

Proposed stormwater drainage systems shall not discharge flows into inadequate downstream systems.

If trash racks or debris barriers are required by the City for pipe or culvert systems, the Engineer of Record shall submit the system design to the Project Manager for approval.

4.02 MINIMUM DESIGN CRITERIA

Storm Frequency – All public stormwater drainage systems shall be designed for the design storm recurrence intervals in the *Stormwater Management Manual*.

Time of Concentration (Tc) for conveyance – Shall be a maximum of 10 minutes for post-developed conditions. However, if the portion of the contributing area within 300-feet upstream of the developed site will remain in an undeveloped condition and is 50% or more of the total contributing area, the post-developed Tc shall be determined by the Engineer of Record and may exceed 10 minutes.

Velocity – All stormwater pipes shall be designed at a grade that produces a mean velocity of at least 3 feet per second when flowing full.

Manning's Equations – When calculating minimum pipe slopes and velocities, the Engineer of Record shall use the Manning pipe friction formula. Manning's equation shall also be used to calculate pipe capacity under open channel (gravity) flow conditions.

Pipe Coefficient – The stormwater pipe roughness coefficient to be used in Manning's equation shall be 0.013.

Flow Control (Detention/Retention) and Water Quality Requirements – All development is required to minimize the rate and amount of runoff to receiving systems and streams as required by the City's *Stormwater Management Manual*, as well as any additional requirements or recommendations from the adopted Stormwater Master Plan covering the development location.

Storm Drainage Facilities – Storm drainage facilities shall be designed and constructed to accommodate all assumed future full build-out flows generated from upstream property within the basin.

4.03 ALIGNMENT AND COVER

Curved alignments in piped stormwater drainage systems, vertically or horizontally, are not permitted.

4.03.01 RIGHT-OF-WAY LOCATION

Stormwater drainage systems shall be located in the street right-of-way, where possible, except as noted in **Subsection 2.07.02**. Stormwater lines shall generally be located 5-feet south or east from the right-of-way centerline. For roadways with 28-feet or less in width, the stormwater line may be adjusted to be a minimum of 3-feet from the centerline. All changes in direction of pipe shall be made at an approved structure. If streets have curved alignments, the center of the manhole structure shall be more than 6-feet from the curb face.

4.03.02 MINIMUM DEPTH

All stormwater lines shall be laid at a depth sufficient to protect against damage by traffic and to drain building footings, where practicable. Minimum depth shall be 30-inches from the top of

the pipe to finished grade in paved areas and 36-inches from the top of the pipe to finished grade at all other locations.

In areas of relatively flat terrain, the Engineer of Record must show that sufficient depth is provided at the boundary of the development to properly drain the remainder of the upstream basin area contributing to the site.

4.03.03 MAXIMUM DEPTH

The maximum depth of bury shall conform to the requirements shown in **Section 2.08**.

4.03.04 EASEMENTS

Easements shall meet the requirements of **Subsection 2.07.02***.*

4.03.05 RELATION TO WATERCOURSES

Stormwater lines shall enter a creek or drainage channel at 60˚ or less to the direction of flow with the confluence of flow oriented in the downstream direction. Outfalls shall be located at a higher elevation than the downstream mean low water level. The mean low water lever is defined as the average height of the low waters of a 10-year period. The area between the mean low water and the outfall discharge location shall be stabilized with material to dissipate energy. The outlet shall have a head wall and scour pad or riprap to prevent erosion of the existing bank or channel bottom. The size of pipe or channel being entered will govern which protective measures are required. All protective measures must conform to the requirements of **Subsection 4.05.04**.

4.03.06 OUTFALLS ON SLOPES

Outfalls on slopes will meet requirements established by the Engineer to provide stabilization of slopes. At a minimum, outfalls proposed on slopes greater than 15% must comply with **Table 4.05.04-1** and meet the discharge requirement of 0.5 cfs, unless approved by the Engineer. Outfalls shall be located at the toe of slope whenever practicable.

4.04 PIPE MATERIALS AND SIZE

Except as noted in **Standard Detail 620, Monolithic Curb and Gutter** and **Standard Detail 621, Type 'C' Curb** and in A below, all public stormwater lines shall be constructed with the following materials: reinforced concrete, D3034 PVC, HDPE solid wall, or Polypropylene smooth interior corrugated exterior pipe as specified in **Subsection 401.02** of the Standard Specifications. Where required, for added strength, ductile iron, PVC C900 or C905 will be used. PVC pipe may not be used for culverts where there is not a connected structure on both the upstream end and the downstream end of the pipe. When HDPE is used for culverts, solid wall SDR-17 or SDR-26 must be used.

Polypropylene or Reinforced Concrete pipe may be used for public detention pipe applications within the right-of-way. All detention pipe diameters are limited to a maximum of 36-inches within the right-of-way. Refer to **Standard Detail 406, Detention Pipe Typical Closed.**

Stormwater drain connections to curb that convey water directly from private property shall be in conformance with **Standard Detail 620, Monolithic Curb and Gutter** or **Standard Detail 621, Type 'C' Curb**.

All public stormwater main lines and lateral lines to catch basins and other inlet structures shall be a minimum of 12-inches in diameter, unless specifically noted below and shall include cleanouts, tracer wire and curb markings as specified in the following:

A. Stormwater lines that convey water directly from private property and connect to catch basins and other inlet structures outside the paved section of the right-of-way may be a

minimum of 4-inches in diameter. These installations may use ABS, PVC Schedule 40 or PVC Schedule 80 pipe materials and must include tracer wire. Cleanouts and curb markings are not required for these installations.

B. Stormwater lines that convey water directly from private property and connect to manholes or other structures within the paved section of the right-of-way may be a minimum of 4-inches in diameter. These installations shall have cleanout and curb marking type and locations consistent with **Standard Detail 307, Sanitary Sewer Lateral**, except that the curb shall be marked with an "ST" rather than an "S".

C. Stormwater lines that convey water directly from private property and connect directly to public stormwater mains will only be allowed when conventional connections, including curb connections and those listed above in A and B, are not practicable. Private lines connecting directly to public stormwater mains may only be 4-inch or 6-inch diameter lines and must connect perpendicular to the mainline. Cleanouts and curb markings, as described in B above, as well as tracer wire along the entire portion of the lateral in the right-of-way, are required for these installations.

Private stormwater drainpipe shall meet the appropriate sections of the Uniform Plumbing Code.

4.05 STRUCTURES

4.05.01 ACCESS

Access for structures shall follow the design standards addressed in **Subsection 3.05.01**.

4.05.02 MANHOLES

Manholes shall be located at all changes in pipe slope, alignment, size, type, and at all pipe junctions with existing or future stormwater lines excluding 4-inch and 6-inch stormwater laterals installed in accordance with **Section 4.04**.

Manhole spacing shall not be greater than 500-feet.

The crowns of incoming pipes shall be at least as high as the crown of the outgoing pipe.

4.05.03 STORMWATER INLETS

Stormwater inlets shall be located at the following locations, but, in no case, be spaced further than 400-feet apart:

A. Within 50-feet of the curb returns on the upstream side of an intersection

B. At the ends of all dead-end streets with a descending grade

C. At intermediate locations so that stormwater flows at the curb line do not exceed 3-feet in width (measured from the curb face) or 3-inches in depth (measured at the curb face)

D. At the upstream or downstream end of the street improvements that abut unimproved roads or undeveloped property

Stormwater inlets shall be capable of completely intercepting the design stormwater flow.

4.05.03A CATCH BASINS

Catch basins shall be located in the roadway at the curb line to receive stormwater runoff and convey it to the main stormwater line.

A single unit double catch basin is required at the low point (sag) of all vertical curves. Refer to **Standard Detail 401D, Double Catch Basin.**

4.05.03B INLET MANHOLES

Where proposed stormwater drainage systems connect to the existing or proposed public stormwater drainage system at a catch basin location, inlet manholes shall be required where any of the following conditions apply. Refer to **Standard Details 404 (A-F).**

A. the pipe connection is larger than 6-inches in diameter,

B. 2 or more pipes discharge to the location, or

C. the design peak flow from the onsite system exceeds 0.5 cfs

4.05.03C DITCH INLETS

Ditch inlets are required any time stormwater is collected from a ditch and conveyed to a piped system.

4.05.03D BEEHIVE INLETS

Where proposed street side stormwater planters connect to the existing or proposed public stormwater drainage system, beehive inlets shall be required.

4.05.04 OUTFALL PROTECTION

The outfalls of all stormwater drainage systems shall be adequately protected to prevent erosion of slopes and channels. All outfalls shall include, at a minimum, the erosion protection as shown in the table below. Alternative approaches to protection may be accepted as approved by the Engineer. Where rock is placed within existing bank slopes, the bank shall typically be excavated a minimum of 18 inches or 1.5 times the size of the largest stone being used, whichever is greater.

(See table on the following page.)

Table 4.05.04-1 ROCK PROTECTION AT OUTFALLS				
PIPE DIAMETER (inches)		**PIPE SLOPE (%)**		**TYPE OF REQUIRED PROTECTION**
Greater than	**Less than or equal to**	**Greater than**	**Less than or equal to**	
6	10	Min	1	Riprap A
		1	4.5	Riprap B
		4.5	20	Gabion Outfall
		20	Above	Engineered energy dissipator required*
10	18	Min	0.5	Riprap A
		0.5	2	Riprap B
		2	8.5	Gabion Outfall
		8.5	Above	Engineered energy dissipator required*
18	36	Min	0.2	Riprap A
		0.2	0.8	Riprap B
		0.8	3.5	Gabion Outfall
		3.5	Above	Engineered energy dissipator required*
36	---	Min	0.1	Riprap A
		0.1	0.6	Riprap B
		0.6	2	Gabion Outfall
		2	Above	Engineered energy dissipator required*

* Engineered energy dissipaters, including stilling basins, drop pools, hydraulic jump basins, baffled aprons, and bucket aprons, are required for outfalls with velocity at design flow greater than 20 fps. These should be designed by a Professional Engineer using published or commonly known techniques found in such references as “Hydraulic Design of Energy Dissipators for Culverts and Channels”, published by the Federal Highway Administration of the United States Department of Transportation; “Open Channel Hydraulics”, by V.T. Chow; And the most current version of the Oregon Department of Transportation Hydraulics Manual. Alternate mechanisms, such as structures fitted with reinforced concrete posts, may require an approved adjustment and must be designed using sound hydraulic principles and considering constructability and ease of maintenance. Bubble-up structures (bubblers) will not be permitted.

Table 4.05.04-2 ROCK PROTECTION DESIGN					
TYPES OF REQUIRED PROTECTION	**GRADATION***	**MINIMUM DIMENSIONS**			
		Thickness	**Width**	**Length**	**Height****
Riprap A	Quarry spalls with 100% passing the 8-inch square sieve, 40-60% passing the 3-inch square sieve, And 0-10% passing the 3/4-inch square sieve	1 foot	Pipe Diameter + 6 feet	8 feet or 4 times the Pipe Diameter, whichever is greater	Pipe Crown + 1 foot
Riprap B	Maximum Stone Size = 24 inches Median Stone Size = 16 inches Minimum Stone Size = 4 inches	2 feet	Pipe Diameter + 6 feet or 3 times the Diameter, whichever is greater	12 feet or 4 times the Pipe Diameter, whichever is greater	Pipe Crown + 1 foot
Gabion Outfall	Engineered – As Required	Engineered – As Required			Pipe Crown + 1 foot

*Riprap to be reasonably well graded and lined with drainage geotextile

When pipe is entering a watercourse the outfall protection shall cover the sides of the water course to the height specified. See **Standard Detail 414, Outfall Protection.

4.06 CULVERTS

Water crossing structures on all creeks and tributaries shall be constructed and maintained so as to not impede or eliminate a native fish species' access to habitat or ability to migrate. In general, use bridge crossings rather than culverts wherever possible. If culverts are utilized, install slab, arch or box type culverts, preferably using bottomless designs that more closely mimic stream bottom habitat. Proposed culvert crossings, regardless of tributary size, intermittent or perennial, shall conform to Oregon Department of Fish & Wildlife and National Marine Fisheries Service's regulations and stream crossing guidelines. In addition to designing stream crossings for fish passage, culverts should include shelves and other design features to facilitate terrestrial wildlife passage.

Culverts within roadside ditches not deemed jurisdictional waterways and 18 inches in diameter or larger, shall have riprap installed at the inlets to protect from erosion. All riprap shall be lined with drainage geotextile in accordance with **Section 205**. The riprap shall be the gradation, thickness and width for riprap A shown in **Subsection 4.05.04** with a length of 5 feet and shall be as high as the designed headwater elevation. Riprap for culvert outlets shall be in accordance with **Subsection 4.05.04.**

Cross culverts shall require a headwall.

Additional requirements may apply to meet State and Federal requirements.

4.06.01 INLET AND OUTLET CONTROL ANALYSIS

The headwater depth for pipes under inlet or outlet control shall be determined using the nomographs contained in the *ODOT Hydraulics Manual.*

4.06.02 HEADWALLS AND ENDWALLS

Pipe headwalls, endwalls, or other approved end protection shall be required where pipe material other than concrete or ductile iron is exposed in the design of an outlet or inlet pipe or where required to provide slope stability. Details of all headwalls, endwalls, and other end protection shall be included in the construction drawings.

4.07 CONVEYANCE SYSTEMS

Conveyance systems shall be designed and constructed to carry the design storm flowing full with no surcharge or pressure flow. Flow conditions in existing pipe systems shall be evaluated on a case by case basis for adequacy in accordance with *SWMM 4.4.1*.

Unless an alternative method is approved by the City in writing, calculation of storm runoff used for conveyance capacity design shall be based on the Santa Barbara Urban Hydrograph (SBUH), the National Resource and Conservation Service Technical Release 55 (SCS TR-55) or the US Environmental Protection Agency Stormwater Management Model (EPA SWMM-Runoff). For drainage basins 10 acres or less, the Rational Method is acceptable.

The rainfall distribution to be used within the City is the design storm of 24-hour duration based on the standard National Resources Conservation Service's (NRCS) Type 1A rainfall distribution using the 24-hour precipitation isopluvials in the National Oceanic and Atmospheric Administration Atlas 2, Volume 10, *Precipitation Frequency Atlas of the Western United States*.

Curve numbers shall be derived from the NRCS runoff curve numbers contained in TR-55 *Urban Hydrology for Small Watersheds*.

Soil types shall be derived from the NRCS Soil Survey for Multnomah County found online at https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

A maximum overland distance for sheet flow used in calculations shall be 300 feet.

Table 4.07 CONVEYANCE DESIGN STORM SIZING CRITERIA

STRUCTURE OR FACILITY	DESCRIPTION	DESIGN STORM RECURRENCE INTERVAL (years)
Storm sewers, ditches and outfall pipes	Draining less than 250 acres (including residential streets, curbs, gutters, inlets, catch basins, connector drains)	10
	Draining greater than 250 acres (including culverts, trunk lines and drainage systems associated with arterial streets)	50
Creek or Stream Channel	Without designated floodplain	50
	With designated floodplain	100

Land use assumptions for analyzing and designing the capacity of the conveyance system for design storm flows shown in **Table 4.07**, above, shall be based on full build-out of the upstream drainage basin based upon City of Gresham zoning and/or realistic estimates of development densities in areas included in recent additions to the Urban Growth Boundary or Urban Growth Reserve.

For large or complex drainage areas containing a variety of different land uses or topography, select several homogenous areas and determine the slope for each and average the slope of them together to determine a representative area slope. The City accepts this simplifying assumption because

it is impossible to explicitly define all of the potential slopes that could occur across anything but a very simple homogeneous area.

4.07.01 HYDRAULIC DESIGN

For new development utilizing an existing, undersized storm conveyance system, there shall be a 1-foot minimum freeboard between the hydraulic grade line and the top of the structure or finish grade above pipe for the conveyance design storm post-development peak rate of runoff.

Stormwater runoff along a street during the peak conveyance design storm event shall not run deeper than 3 inches against the curb or extend more than 3 feet into the roadway, measured from face of curb.

4.08 DOWNSTREAM ANALYSIS REPORT

The analysis of downstream effects must be analyzed to determine if construction of the project will create any drainage problems downstream or will make any existing problems worse. Requirements for the Downstream Analysis Report are contained in the *Stormwater Management Manual*.

4.09 EROSION PREVENTION AND SEDIMENT CONTROL

Developments shall provide erosion prevention and sediment control methods in accordance with the City of Gresham *Erosion Prevention and Sediment Control Manual* to limit the transportation of soil materials by stormwater runoff and construction activities during all phases of the construction project.

4.10 STORMWATER FLOW CONTROL (DETENTION/RETENTION)

Flow Control (detention/retention) requirements and methods can be found in the *Stormwater Management Manual*.

4.11 STORMWATER QUALITY TREATMENT

Stormwater quality treatment shall be in accordance with the *Stormwater Management Manual*.

4.12 OPEN CHANNEL DESIGN

Open channels shall be designed to prevent scouring of the channel. If a minimum slope of 0.1% cannot be achieved then the channel shall be designed with features that encourage infiltration, water use by vegetation or evaporation.

Vegetation-lined channels shall be used whenever practicable as determined by the City. Rock-lined channels shall be used only where a vegetative lining will not provide adequate protection from erosion. Where riprap protection is specified, riprap shall be placed over a woven geo-textile fabric.

Constructed open channels shall be sized to pass the required flows without causing erosion and shall have side slopes no steeper than 2:1 (2 horizontal to 1 vertical).

Manning's Roughness Coefficient ("n") shall generally comply with the *ODOT Hydraulics Manual*.

No protruding pipes, culverts or other structures, which reduce or hinder the flow characteristics of the channel, will be allowed. Channel connections shall be designed to prevent scouring. All pipe connections shall match side slopes and incorporate a headwall.

Open channel designs shall be based on the minimum level of protection shown in **Table 4.12**, below. Maximum design velocity shall be 6 feet per second (fps), unless approved by Engineer.

Areas of extreme curvature, changes in channel cross-section, or low-flow channels with design flow velocities exceeding 3 fps shall be designed and constructed with bank stabilization to consider additional potential for scouring from turbulent flows.

Table 4.12 PROTECTION FOR NEW CHANNEL CONSTRUCTION

VELOCITY AT DESIGN FLOW (fps)		REQUIRED PROTECTION	THICKNESS (ft)	MINIMUM HEIGHT ABOVE DESIGN WATER SURFACE (ft)
Greater than	Less than or equal to			
0	5	Vegetation lining	Not applicable	0.5
5	8	Bioengineered lining	Not applicable	1
		Riprap A[1]	1.5	1
8	12	Riprap B[1]	2.5	2
12	20	Slope mattress, etc.	Varies	2
20		Engineer designed per *ODOT Hydraulics Manual*		

[1]Gradations for Riprap A and B can be found in **Table 4.05.04-2**.

4.13 REAR LOT DRAINAGE

When subdivision lots drain to the rear, it may be necessary to provide a backyard storm drain system. The preferred option is for a single pipe and easement to be established across the adjacent downhill parcel. If this is infeasible, a public main line collecting drainage from multiple properties may be considered. Any public main shall be publicly owned, in a public easement, and must follow requirements outlined in these ***Public Works Standards***.

Publicly maintained storm systems shall be within an easement granted to the City that meets the easement requirements in **Chapter 2**.

4.14 PRIVATE STORM DRAIN SYSTEMS

Private storm drain systems shall be in accordance with the *Stormwater Management Manual* and the *Oregon Plumbing Specialty Code (OPSC)*.

END OF CHAPTER

CHAPTER 5 - WATER SYSTEM DESIGN

5.01 GENERAL DESIGN REQUIREMENTS

Water distribution systems shall be designed to meet *Oregon Administrative Rule Chapter 333* (including *Oregon Revised Statute (ORS) 448*), American Water Works Association (AWWA) Standards, and guidelines of the current City of Gresham Water System Master Plan (Master Plan) and its updates.

Water system design shall provide adequate flow for fire protection during projected maximum water usage and consumption. Required water system demands shall be met while maintaining the minimum operating pressures of 20 psi required by the State of Oregon. For single-family residential homes less than or equal to 3,600 square feet (including attached single-family homes (based on aggregate size)) the minimum static pressure shall be 35 psi and the minimum available fire flow shall be 1,000 GPM. For all other developments, including areas with single-family homes larger than 3,600 square feet or mixed-use areas, the required fire flow shall be as determined by Fire & Emergency Services Department up to a maximum of 3,500 GPM. Developments which require fire flows above 3,500 GPM, shall provide supplemental fire flow as approved by the City.

Where system static pressures allow, and field flow measurement or system modeling shows adequacy, velocities in distribution mains may be designed, but shall not exceed 8-feet per second in cast iron piping and 14-feet per second in ductile iron piping, for combined fire, domestic, and irrigation flows. Velocity in service lines (as specified in **Section 5.06**) shall be designed not to exceed 10-feet per second.

Water system design shall meet distribution needs for projected maximum daily demand within the service area and; New water systems shall allow for future extensions beyond present development that are consistent with the Master Plan and; Shall be sized according to the current zoning area fire flow needs, velocity, standards, and water modeling determinations.

All water lines shall be located within the public right-of-way as specified in **Subsection 5.02.01**. The Engineer, under special conditions, may allow a public water line to be located within a public easement as referenced in **Subsection 2.07.02**.

The water system shall be constructed using mechanical restraint. Thrust and straddle blocks will only be required at water line taps greater than 2 inches or at connections to the existing system where the degree of restraint of the existing system is unknown or insufficient as determined by the Engineer.

The distribution system mains shall be looped at all possible locations. All developments will be required to extend mains across existing or proposed streets for future extensions of other developments. All terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended.

A portion of the public water system within the City boundaries is within the jurisdiction of the Rockwood Water People's Utility District (PUD). The public water system within the Rockwood Water PUD shall follow requirements and standards set forth by Rockwood Water PUD.

5.02 ALIGNMENT AND COVER

Curved alignment for water mains is permitted and shall follow the street centerline when practical. The minimum allowed radius shall be based on allowable pipe deflection for the pipe diameter and the pipe laying length but shall not exceed AWWA specs or manufacturer specs.

5.02.01 RIGHT-OF-WAY LOCATION

Where water mains are located within narrow rights-of-way (less than 50-feet), location of water main shall be reviewed and approved by the Engineer.

In general, water mains shall be located 12-feet south or east from the right-of-way centerline or as approved by the Engineer. For roadways less than 28-feet in width, the water line location shall be a minimum of 4-feet from the face of curb and shall maintain 5-feet minimum center-to-center spacing with the stormwater line. Except as provided in **Subsection 2.07.02**, all water mains and service lines shall be in the public right-of-way. All abrupt changes in vertical or horizontal alignment shall be made with a fitting and adequate thrust restraint. Refer to **Standard Detail 507, Horizontal Thrust Blocking, Standard Detail 508, Vertical Thrust Blocking and Standard Detail 509, Straddle Block**.

5.02.02 MINIMUM DEPTH

The standard minimum depth of bury for water mains within the street right-of-way shall be 36-inches from the top of the pipe to the finished grade. **Standard Detail 214, Trench and Backfill,** will be utilized for all water pipes installed.

The minimum depth for mains in unimproved areas shall be 48-inches from the top of the pipe to the finished grade. See **Subsection 5.02.07(B)** for minimum depth requirements under water crossings. Service lines shall have a minimum cover of 30-inches, except at road ditch crossings where the cover may be reduced to 24-inches.

Finish grade shall normally mean the existing or proposed pavement elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade shall mean final ground elevation at the water pipe alignment.

Deviation from the above standards will typically only be considered on a case-by-case basis for underlying rock strata and significant utility conflicts. Where the water main or service is installed at a depth of 24-inches or less below finished grade, controlled low-strength material (CLSM) shall be used in place of standard backfill material.

5.02.03 MAXIMUM DEPTH

The maximum depth of bury shall conform to the requirements shown in **Section 2.08**.

5.02.04 SEPARATION WITH SANITARY SEWER LINES

In all instances, the distance between utilities shall be measured surface to surface. When water mains or service lines are in a parallel configuration with gravity sanitary sewer mains or laterals, the separation between the two shall be as indicated on **Standard Detail 510, Gravity Sanitary Sewer, Water Line Separation.** Whenever possible 10-feet of clear horizontal separation shall be maintained between sanitary sewer and water main lines.

When approved by the Engineer, water mains and service lines may be installed with a minimum 5-feet clear horizontal separation from gravity sanitary sewer mains and laterals and shall be installed such that the bottom of the water line is above the top of the sanitary sewer line.

When water mains or service lines cross gravity sanitary mains or laterals, whenever possible, the bottom of the water line shall be installed with 18-inches of clear vertical separation above the sanitary sewer line.

Separation from sanitary sewer force mains shall be reviewed on a case-by-case basis. Any exception to this standard shall be reviewed by the Engineer and be in accordance with **Standard Detail 510, Gravity Sanitary Sewer, Water Line Separation.**

5.02.05 SEPARATION WITH UTILITIES OTHER THAN SANITARY SEWER LINES

The minimum spacing between water mains and utilities other than sanitary sewer, shall be 3-feet horizontally. This separation also applies to water service and utility service lines.

Where water mains are being designed for installation parallel with other water mains, utility pipes, or conduit lines, the vertical separation shall be 12-inches below or in such a manner that will permit future side connections of mains, hydrants, or services, and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities is required, the minimum vertical clearance shall be 6-inches. For cathodic protection at utility crossings, see **Section 5.03**.

5.02.06 EASEMENTS

Easements shall meet the requirements of **Subsection 2.07.02**.

5.02.07 RELATION TO WATERCOURSES

New water mains may cross over or under existing streams, ponds, rivers, or other bodies of water.

Mains crossing stream or drainage channels shall be designed to cross as close to perpendicular to the channel as possible.

Valves shall be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding.

A. **Above Water Crossings** – The pipe shall be designed by the Engineer of Record to provide support, anchorage, and protection from freezing and damage, yet shall remain accessible for repair and maintenance. All above water crossings will require review and approval by the Engineer.

B. **Underwater Crossings**

(1) The minimum cover from the bottom of the stream bed or drainage channel to the top of pipe shall be 36-inches, except as noted below.

(2) A scour pad centered on the water line will be required for mains when the cover from the top of the pipe to the bottom of the stream bed or drainage channel is less than 36-inches. The scour pad shall be concrete, 6-inches thick and 6-feet wide; reinforced with #4 bars 12-inches on center both directions; and shall extend to a point 10 feet beyond the mean high-water bank level. There shall be a minimum 6-inches clearance between bottom of pad and top of water line.

(3) The following surface water crossings will be treated on a case-by-case basis:

(a) Stream or drainage channel crossing for pipes 12-inches nominal diameter and greater.

(b) River or creek crossings requiring special approval from the other jurisdictions.

5.03 PIPE MATERIALS AND SIZE

All public water distribution systems shall be constructed with ductile iron pipe, in accordance with **Subsection 501.02.02**. When a potentially corrosive condition is encountered, all ductile iron pipe will be polyethylene encased per **Subsection 501.02.08** and meeting Ductile Iron Pipe Research

Association (DIPRA) and AWWA Standards. Where an active cathodic protection system is encountered, Polyvinyl Chloride (PVC) pipe may be considered as an alternate to ductile iron pipe, with approval by the Engineer. All pipe joints shall be fully mechanically restrained.

Polyvinyl chloride (PVC) pipe, 4-inches to 12-inches, shall conform to AWWA C909 (C900 and C905 may be approved on a case by case basis), in accordance with **Subsection 501.02.03**. Tracer wire, per **Subsection 501.02.07**, shall be installed with all PVC water pipe.

Water distribution main sizes shall meet the design requirements listed above and conform to the following:

A. 4-inch pipe shall be used in residential zones, on dead end streets, only when approved by the Engineer. The maximum length may not exceed 250 feet. Not more than 12 services may be connected.
B. 6-inch pipe shall be the minimum standard size of distribution mains and shall only be used directly off of looped systems of 8-inch and larger pipe sizes. No hydrants are permitted on 6-inch lines.
C. 8-inch pipe shall be used for mains supplying hydrants requiring a flow rate of 1,000 GPM.
D. 10-inch or larger pipe shall be required as specified in the Master Plan and as required by the Engineer to meet Commercial and Industrial usage or fire flow demands exceeding 1,000 GPM.

The distribution grid shall be looped at 600-foot maximum intervals. Transmission water mains identified by the Engineer do not require looping. Dead end mains, permanent or temporary, shall be provided with a properly sized blow-off per **Standard Details 506(A-B), Blowoff Assembly**.

5.04 APPURTENANCES

5.04.01 VALVES

Valves shall be the same size as the pipes in which they are installed with. Valve types and materials shall conform to **Section 501**.

Distribution system valves shall be located at and flanged to the tee or cross fitting. Use of MJ valves must be approved by the Engineer and must be mechanically restrained. There shall be a sufficient number of valves located in the distribution system so that, whenever practicable, only 3 valves, but not more than 4, must be operated to affect any one shutdown. A tee intersection shall have valves in 2 branches and a cross intersection shall have valves in 3 branches. The spacing of valves in distribution systems shall be such that the length of any one shutdown in commercial or industrial areas shall not exceed 500-feet or 800-feet in other areas. Transmission water mains shall have valves at not more than 1,000-foot spacing. Hazardous crossings such as creeks, railroad, and freeway crossings shall have valves on each side. Valves shall be accessible at all times.

When a hydrant tee or a tee branching to a cul-de-sac blow-off is installed on an uphill sloped water line, install a main line valve on the uphill run of the hydrant or blow-off tee to allow for release of air from hydrant or blow-off. An additional main line valve may be needed on the downhill run of the tee for other operational purposes.

Distribution tees and crosses with valves for future branch lines on transmission water mains may be required at the direction of the Engineer.

5.04.02 FITTINGS

All fittings shall be constructed and mechanically restrained in accordance with **Section 501**.

When a corrosive potential condition is encountered, all fittings will be polyethylene encased with an 8-mil tubing meeting Ductile Iron Pipe Research Association (DIPRA) and AWWA Standards.

5.04.03 FIRE HYDRANTS

The public water system supplying public fire hydrants shall be designed to provide up to a maximum of 3,500 GPM. Minimum fire flow in single-family residential areas shall be 1,000 GPM, except in areas where homes exceed 3,600 square feet or areas of mixed use, in which case fire flows will be as determined by the Fire & Emergency Services Department.

The distribution of hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing of approximately 400-feet along the street frontage, except for commercial and industrial areas where hydrant spacing shall be approximately 300-feet along the street frontage. Additional hydrants shall be placed as required by the Fire & Emergency Services Department and the Engineer.

Residential hydrants shall be located as close as possible to the corner of street intersections.

No fire hydrant shall be installed on a main of less than 8-inches inside diameter. The hydrant lead shall be a minimum of 6-inches nominal diameter.

All fire hydrants will be located behind the curb in accordance with **Standard Detail 501A, Fire Hydrant Assembly**. If no curb exists, the location must be approved by the Engineer. If any public hydrant encroaches on private property, an easement must be provided to the City. In general, fire hydrants will be located at or near the point of curvature of the curb return or at a common property line. Pumper port of fire hydrant shall be perpendicular to the curb line or shoulder, as applicable.

No hydrant shall be installed near an existing above-ground facility which would impede on the fire hydrant clear zone shown in **Standard Detail 501C**, nor shall any above-ground facility be installed within the clear zone per **Standard Detail 501C** of any existing hydrant.

Hydrant installation shall conform to **Standard Details 501(A-C)** and shall include the installation of a blue reflective raised pavement marker. Maximum 6-foot bury hydrants will be required in all installations. Installation of hydrant extensions will not be allowed, unless approved by the Engineer.

Unless the fire hydrant is off of a fire line/fire sprinkler service, the hydrant shall be placed on the same side of the right-of-way as the water line serving the fire hydrant. Other proposed locations must be approved by the Engineer.

Guard posts shall be required for protection from vehicles when necessary. See **Subsection 502.03.01**.

Fire hydrants shall be permanently equipped with a 5-inch Storz quick connect adaptor on the 4.5-inch pumper port. See **Subsection 502.02.01.**

5.04.04 PRESSURE-REDUCING AND COMBINATION AIR VALVE UNITS

The City's water distribution system is divided into several pressure zones. Where water systems cross these zone lines, a pressure-reducing valve station may be required. The specific design and location for such valves will be reviewed and approved by the Engineer.

When shown on the plans or designated by the Engineer, combination air valve units, per **Standard Details 505(A-B)**, shall be installed. Such valves will be required on large diameter

transmission water mains at all high points in grade and at other points as determined by the Engineer.

5.04.05 Railroad or Freeway Crossings

All railroad and freeway crossings assumed to be of a hazardous nature, or as determined by the City, shall have valves on both sides of the crossing. Casing of railroad or freeway crossings, if required, shall be as noted in the permit from the respective agency.

5.05 Backflow Prevention

Backflow prevention assemblies shall be required on all irrigation services, fire service lines, commercial/industrial water services, and as provided for in *Chapter Five of the Gresham Revised Code*. Backflow prevention assemblies shall be located on the lot it serves at the right-of-way line. When it is not possible to locate the assembly at the right-of-way line, the proposed location must be approved by the Engineer before installation. For installation requirements, see **Subsection 502.03.05**.

For installation requirements on assemblies 3-inches through 10-inches, see **Subsection 502.03.05**. All backflow prevention assemblies shall be Oregon Health Authority approved and testable.

All backflow prevention assemblies shall be installed, inspected, tested, and registered with the City prior to turning on the water service. All meter stops and valves shall remain locked and off until the testing has been approved. Cost of all installation, including all cost of initial inspection and testing fees, shall be the responsibility of the customer. The customer will be responsible for all maintenance and testing of the assembly and vault, when used.

5.06 Water Service Lines

The sizes of water service lines that may be used are 1-inch, 2-inch, 4-inch, 6-inch, 8-inch, 10-inch, and 12-inch. Water service lines will be reviewed for impacts on the distribution system and shall not be greater in size than the distribution main. In no case shall a new service be provided off of an existing galvanized water line.

Domestic service lines, 1-inch and 2-inch, shall extend from the main to behind the curb, with a meter setter (2-inch only) and meter box located at the termination of the service connection (**Standard Details 502 and 503**. Meter shall be provided and installed by City Water Operations personnel. Whenever possible, individual service connections shall terminate in front of the property to be served along the street frontage where property is addressed and shall be located 18-inches each side of a common side property line. Water service via an easement across a separate lot or parcel under separate ownership, or capable of being sold off, is not allowed unless otherwise approved by the Engineer.

For services 4-inch and larger (3-inch and larger meters), a design drawing must be submitted to the City showing the vault and fitting requirements with the expected flow (normal and maximum daily flow) requirements and proposed usage, and meter vaults shall be placed at the entrance to the property being served, unless otherwise approved by the Engineer. See **Standard Details 513(A-D)**.

Multiple service connections to a premises shall be laid out to follow a logical sequence of addresses to facilitate matching of service connection to building(s). Each meter must have its own service line and connection to a water main. No manifolding will be allowed unless approved by the Engineer.

When a potentially corrosive condition is encountered, and the copper service passes over or under an active cathodic protection system, the service will be installed in a Schedule 40 PVC conduit for a distance of 10-feet on each side of the active cathodic protection system. All conduit placements shall be included in the as-built plans.

Table 5.06 WATER & FIRE SERVICE AND METER SIZING			
SERVICE SIZE (INCHES)	**METER SIZE (INCHES)**	**MAXIMUM INTERMITTENT OPERATING CAPACITY (GPM)**	**MAXIMUM CONTINUOUS OPERATING CAPACITY (GPM)**
1	¾	30	30
1	1	50	50
2	1½	120	120
2	2	190	160
4	3	435	400
4	4	750	750
6	6	1,600	1,600
8	8	2,800	2,700
Notes:			
1. Meters larger than 8-inches will be reviewed on a case-by-case basis			

Fire Service – There are 3 categories of private fire services: (1) hydrants, (2) fire sprinkler lines, and (3) combination hydrant and fire sprinkler lines.

The water fire service line shall normally extend from the main to the property line and end with a vault, metering device, and valves. All costs for the installation shall be the responsibility of the property owner being served.

Fire service lines shall be metered by a detector meter on the approved backflow prevention assembly.

Whenever possible, the fire service shall be located along the street frontage where the parcel is street addressed.

Fire sprinkler systems for single-family residences or rowhouse-type residences shall be served through a standard metered service. The fire sprinkler system may be served through the domestic service for the same residence. The combined domestic, irrigation, and fire sprinkler flow demands may not exceed the City of Gresham allowable flow for that particular size of service and meter.

A vault for a double check detector assembly, greater than 2 inches, will be required when a development provides a fire suppression system. The vault drawing shall be included on construction drawings submitted to the City. See **Standard Detail 514(A-H)**.

5.07 System Testing

Prior to connection to the existing water system, all new water systems shall be individually pressure tested, chlorinated, and pass a test for bacteria. All testing shall be performed in accordance with the Standard Specifications, including but not limited to the requirements of **Subsections 503.02.07 and 503.02.08,** and in the presence of an Inspector.

5.08 Water Quality Sampling Stations

Water sampling stations will be required and installed in all new subdivisions, or as directed by the Engineer. In general, install one station for every 20 single-family lots. See **Standard Detail 504, Water Sampling Station**.

End of Chapter

CHAPTER 6 - TRANSPORTATION DESIGN

6.01 GENERAL DESIGN REQUIREMENTS

All street designs shall provide for the safe and efficient travel of motorists, bicyclists, and pedestrians. Streets shall be designed to carry the recommended traffic volumes identified for each street's functional classification. Functional classifications are set forth in the current Transportation System Plan (TSP), which is Volume 4 of the Gresham Comprehensive Plan. Additional design criteria are set forth in Volumes 1, 2 and 3 of the Comprehensive Plan.

Streets shall be designed to meet or exceed minimum design guidelines, including Americans with Disabilities Act (ADA) regulations. These guidelines are set forth in the latest edition of the American Association of State Highway and Transportation Officials "A Policy on Geometric Design of Highways and Streets" (AASHTO Policy). Traffic control devices shall conform to the latest edition of the "Manual on Uniform Traffic Control Devices (MUTCD)" issued by the Federal Highway Administration (FHWA) and the "Oregon Supplement to the MUTCD" produced by the Oregon Department of Transportation (ODOT). All infrastructure improvements shall meet the minimum design standards as outlined by the United States Access Board. Any retrofit improvement affecting existing infrastructure shall require that infrastructure to be upgraded to Access Board standards.

All vertical and horizontal curves shall meet the guidelines of the AASHTO Policy and the design speed for each street's functional classification. Where practical, the Engineer of Record shall provide the decision sight distance for the design speed based on the methodology in the AASHTO Policy, or the stopping sight distance based on the 85% speed as set forth in the AASHTO Policy, whichever is greater. Only with the approval of the Engineer shall a lesser sight distance be permitted.

6.01.01 ACCESS

All developments shall be provided with public street access. Streets (public and/or private), driveways, and easements shall be as set forth in other sections of these Design Standards.

6.01.02 PERMANENT DEAD-END STREETS

A standard cul-de-sac turnaround shall be provided at the end of a permanent dead-end street that does not provide looped circulation, except on minor access streets. In keeping with the *Gresham Community Development Code (GCDC) Section A5.402(F),* permanent dead-end streets shall be limited to service no more than 25 dwellings and shall not exceed 200-feet in length. See **Standard Detail 615, Standard Cul-de-sac**.

Branch turnarounds shall be used at the end of minor access streets. The maximum length of the minor access street, including the turnaround, shall be 150 feet. To serve emergency services and recycling and solid waste services, branch turnarounds shall also be used at the end of all other classifications of roadways which dead-end but are intended to be extended in the future, except in the cases where these roadways are less than 150 feet in length and do not serve any property access. See **Standard Detail 616, Branch Turnaround**.

A dead-end street is measured from the right-of-way line at the furthest end of the dead-end street to the nearest right-of-way line at the first intersecting street.

6.01.03 TRAFFIC ANALYSIS

The Engineer will require a traffic analysis report based on the type of development and its potential impact to existing street systems. A traffic analysis will generally be required for a development when:

A. it will generate 1,000 vehicle trips or more per weekday based on the current ITE Trip Generation Manual;

B. a development's location, proposed site plan, or traffic characteristics could affect traffic safety, access management or street capacity;

C. known traffic problems or deficiencies exist in a development's study area; or

D. a proposed change in zoning designation could result in higher trip generation than current zoning.

The report will be prepared by a traffic engineer licensed in the State of Oregon. At a minimum the report shall contain the following:

1. Purpose of Report and Study Objectives

A discussion of key traffic issues to be addressed and the transportation system and development objectives related to a specific development.

General transportation system objectives are to:

A. maintain safe and efficient traffic flow on the surrounding street system;

B. provide effective and safe transfer of vehicle traffic between the site and the street system;

C. provide convenient, safe, and efficient onsite and offsite movement of vehicles, pedestrians, transit, service and delivery trucks, and bicycles;

D. effectively mitigate adverse site-generated traffic impacts on affected streets and intersections – site-specific objectives may be established by the Engineer for each study; and

E. analyze accident history in study area and evaluate impacts of site-generated traffic.

2. Executive Summary

The Executive Summary shall contain a concise summary of the study purpose/objectives, site location and study area, development description, key assumptions, findings, conclusions, and recommendations.

3. Description of Site and Study Area Streets

Include a description of the site and study area, existing traffic conditions and accident history in the study area and anticipated nearby development and committed street improvements that would affect future traffic in the study area.

The study area will be defined to include:

A. All streets, ramps, and intersections through which peak-hour site traffic comprises at least 5% of the existing capacity of an intersection approach, and

B. All street segments and intersections impacted by site traffic on which existing overall volume to capacity (V/C) ratio exceeds 0.90, or

C. All street segments and intersections where accident character or residential traffic character is expected to be significantly impacted.

4. Onsite Traffic Evaluation

Include an evaluation of the proposed (and alternative) site access locations; the adequacy of access drive depth, driveway lanes, and queuing storage; and the safety and efficiency of proposed vehicular circulation, parking layout, and pedestrian and service vehicle routes/facilities, together with recommendations for onsite traffic markings and controls.

5. Offsite Traffic Analysis

The analysis shall include:

A. Existing p.m. peak-hour counts by traffic movements at intersections affected by generated traffic from the development (use traffic flow diagrams). Bicycle, pedestrian, and heavy vehicle counts shall be included. Site peak-hour and a.m. peak-hour counts may also be required at the Engineer's discretion.

B. Background p.m. peak-hour volumes for these same intersections. Site peak-hour and a.m. peak-hour counts may also be required at the Engineer's discretion. Background traffic includes existing volumes plus traffic projected from developments that have filed a land use application.

C. Project build-out p.m. peak-hour volumes for these same intersections and proposed access points (total volumes when the development is in full service, use traffic flow diagrams). Site peak-hour and a.m. peak-hour counts may also be required at the Engineer's discretion. In the case of zoning changes, the traffic study shall assume land uses that result in reasonable worst-case trip generation and the study shall also include a 20-year forecast.

D. A determination of the p.m. peak-hour intersection and individual movement volume to capacity (V/C) ratios at each intersection and access point studied for the existing, background, and build-out conditions. For signalized intersections, the V/C ratio shall be determined using existing timing plans and lane configurations. At Engineer's discretion, V/C ratios for the site peak hour and a.m. peak hour may also be required. All intersections must be shown to meet City performance standards (see subsection G., below) in their existing condition or improvements must be recommended that will meet the standards.

   Recommended improvements should be specific. As an example, if a traffic signal is recommended, the recommendation should include the type of traffic signal control and what movements should be signalized. If a storage lane for right turns or left turns is needed, the recommendation should include the amount of storage needed. If several intersections are involved for signalization and an interconnect system is considered, specific analysis should be made concerning progression of traffic between intersections.

E. A determination of the need for traffic signals. This should include a traffic warrant analysis based on the MUTCD criteria.

F. A discussion of bike and pedestrian usage and the availability of mass transit to serve the development.

G. A report of performance based on the following criteria. Minimum performance levels must be maintained at intersections. Different performance standards apply depending on where in the City the intersection is located and whether it is signalized. At signalized intersections that the City has determined to be within Metro-designated Regional or Town Centers (Downtown Gresham, Central Rockwood, and the town centers within the Pleasant Valley and Springwater Plan Areas), the intersection V/C ratio must be 0.99 or lower and there is no maximum V/C ratio for individual movements. At all other signalized intersections, the intersection V/C ratio must be 0.90 or less, with no individual movement having a V/C ratio larger than 0.95. For stop-controlled intersections, the V/C ratio for a minor approach must be 0.95 or less. The V/C ratios should be calculated using the methodology in the Transportation Research Board's Highway Capacity Manual. The Engineer may approve other methods.

6. Recommendations for Public Improvements

Recommendations should be made for external roadway improvements, such as additional through lanes and turn lanes, and traffic control devices necessitated as a result of the development. Recommended improvements to transit facilities and pedestrian and bike circulation should also be reported.

The recommendations should specify the time period within which improvements should be made, particularly if improvements are associated with a phased development, the estimated cost of improvements, and any monitoring of operating conditions and improvements that may be needed. If needed street improvements unrelated to the development are identified during the analysis, such improvements should be reported.

Traffic signals proposed within 1/2-mile of an existing signal shall incorporate a Synchro/SimTraffic analysis to verify compatibility of operation. Where time-of-day plans are in operation, proposed signals shall be analyzed with those time-of-day plans and recommendations made accordingly.

7. Access Management

On sites with arterial and collector street frontages, the report shall evaluate and recommend the use of access management plans or techniques to:

A. separate basic conflict areas (reduce number of driveways or increase spacing between driveways and intersections); and

B. remove turning vehicles or queues from the through lanes (reduce both the frequency and severity of conflicts by providing separate paths and storage area for turning vehicles and queues).

These techniques may include turn restrictions, striping, medians, frontage streets, channelization of lanes or driveways, shared driveways and access between similar uses, access consolidation, lanes for left or right turns, and other transportation system management (TSM) actions.

8. Safe Routes to Schools

Traffic studies for developments including a school shall include a “Safe Routes to School Study”. The purpose of the study is to designate primary walking routes that are safe for children to walk to and from school. The routes should guide students over the safest and best path to and from school, at a minimum from all four cardinal directions. The primary walking routes should be streets that are likely to have the most students using them to walk or bike to school. The routes should cross the fewest major streets possible and have the most protection available from existing traffic controls. The study shall inventory the primary walking routes by identifying missing infrastructure and obstructions along the sidewalk path, such as missing ADA ramps or utility pole intrusions in the sidewalk. If necessary,

school boundaries should be revised to eliminate extremely hazardous conditions, otherwise bus transportation should be considered. At times, children may be required to take a longer route to avoid hazardous locations, or to use existing safety features or controls.

9. Technical Appendix

The technical appendix shall include worksheets, charts, software-generated reports, and drawings to support findings described in the body of the report. Developer should be prepared to provide HCS, Traffix and Synchro/SimTraffic files used in the traffic analysis report. The files shall be clearly identified for easy reference.

6.02 STREETS

6.02.01 GENERAL

Corner curb extensions are only allowed on streets with a local street functional classification and shall be located at intersections only. No bulb-outs are allowed at mid-block locations unless approved as an exception by the Engineer.

Eyebrow corners, per **Standard Detail 617, Eyebrow Corner**, are only allowed on local streets with the approval of the Engineer. Eyebrow corners may be required to provide sufficient lot frontage, for adequate emergency service clearance or when the minimum horizontal curve radius cannot be met.

6.02.02 FUNCTIONAL CLASSIFICATION

All streets within the City shall be classified as listed in the Transportation Systems Plan (TSP) except as noted herein. The classification for any street not listed shall be determined by the Manager.

The Downtown/Civic Local street section, streets with unique sections in the Downtown Plan District, and the Roberts street section shall follow all requirements for Local Streets. The Civic Connector street section shall follow all requirements for Collector Streets.

6.02.03 ALLEYS

Alleys may be provided in commercial, industrial, and residential developments with approval of the Engineer. Alleys shall be designed for one-way operation.

Alleys must begin and end at connections with streets classified between and including Minor Arterial and Local Queuing Streets. All lots must have frontage to a public street, other than an alley, unless otherwise allowed by the *GCDC*. The length of any alley shall not exceed 400 feet. If there are parking restrictions on the fronting public street or there is no fronting public street, additional parking spaces must be provided off the alley.

Alleys may be designed and constructed to be Residential Alleys unless one or more of the following conditions are met whereupon the alley shall be designed and constructed as a Commercial/Industrial Alley:

A. The alley is in a commercial or industrial zone

B. The alley is longer than 200 feet

C. There are public utilities in the alley

D. The alley is designed with a horizontal curve

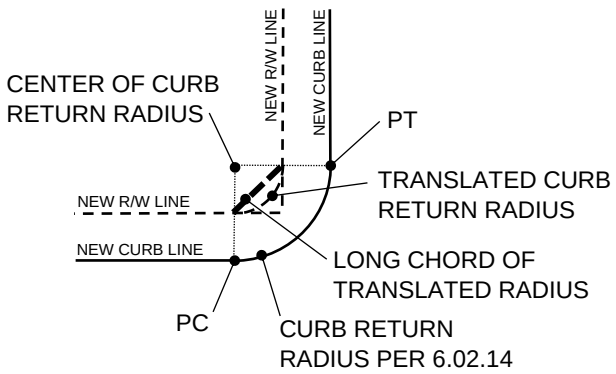
Alleys shall be dedicated to the City as right-of-way unless specified otherwise by the Engineer.

6.02.04 PRIVATE ACCESSWAYS

In general, private accessways shall be provided for multi-family developments such as condominiums and shall be connected to public streets with a concrete driveway approach per **Standard Detail 618, Driveway Approach or Standard Detail 619, Curb Return Driveway Approach**. If those accessways are named with a street sign, they shall also include "PRIVATE STREET" signage and those signs shall be placed at the intersection with the public street to clearly identify the accessway as private.

6.02.05 RIGHT-OF-WAY AND PAVEMENT WIDTH

At a minimum, right-of-way dedication at intersections shall be along the long chord of the curb return radius (in accordance with **Subsection 6.02.14**) translated back to the right-of-way line. See diagram below.



Right-of-way and pavement widths for each street's functional classification are identified in the Standard Details of the ***Public Works Standards***. Gresham roads are classified as Arterials, Collectors, or Local Streets, with each classification having multiple street types. Special design overlays for boulevard treatments are required in the locations as shown in the current TSP Functional Classification Map. Additionally, multi-use path treatments are required in the locations shown in the adopted City of Gresham Paths and Trails Master Map, which can be found in Appendix J of the Parks and Recreation, Trails and Natural Areas Master Plan.

The standard local street classification in residential areas is the Local Queueing Street, with a 26-foot pavement width curb to curb. The Local Transitional Street, with a 32-foot pavement width, applies in place of the Local Queueing Street the following areas:

A. Continuation of existing local streets in established neighborhoods to the next intersection.

B. In multi-family or mixed-use neighborhoods where density precludes queuing streets due to insufficient off-street parking and breaks in on-street parking, as determined by the Manager.

C. On primary emergency response routes.

D. On local streets where volumes are expected to exceed 800 average daily trips (ADT).

For streets designated Minor Arterial and below, the Engineer of Record must consider design modifications to conserve major trees in the public right-of-way and submit to the Project

Manager for review. Pavement width on a Minor Arterial Street may be reduced to no less than 34-feet, consisting of two 11-foot travel lanes and two 6-foot bicycle lanes.

All street sections can include green street features, such as stormwater planters, in the planter strip. The typical planter strip width if green street features are included is 6 feet for arterials and 4 feet for local streets, with a minimum planted width of 3 feet required.

6.02.06 HALF-STREET AND FRONTAGE IMPROVEMENT CONSTRUCTION

Where construction of a half-street is justified, the right-of-way and pavement width will be approved by the Engineer. The pavement width shall be at least one half of the standard street's functional classification width, but in no case shall the pavement width be less than 20 feet. Half-streets will only be approved when the abutting or opposite frontage property is undeveloped, and the full improvement will be provided (upon right-of-way dedication) with development of the abutting or opposite frontage property. Half-streets shall be signed "No Parking" on the improved (curb) side of the street and, if necessary, the unimproved side of the street to provide a clear travel way of 20 feet. Right-of-way dedication for a half street must include a 6-inch-wide monumentation strip between the pavement and the abutting or opposite undeveloped property to allow for the installation of signs.

A development on an unimproved substandard street shall be responsible for constructing a continuous 20-foot half street to a connection with the nearest standard (publicly-maintained) street.

Frontage improvements and analysis of existing pavement sections will be required in cases where a paved street that is substandard exists along the frontage to be developed. Required actions will be based on the design life remaining in the pavement.

Table 6.02.06 REQUIRED ACTION BASED ON DESIGN LIFE

DESIGN LIFE REMAINING	ACTION
0-10 Years	Replace the half-street pavement
10-20 years	Replace the existing half street pavement at the Manager's discretion
20+ years	Replacement not required

6.02.07 PAVEMENT DESIGN

In general, all streets shall be constructed with hot mixed asphalt concrete (HMAC); however, other materials such as Portland Cement Concrete (PCC), concrete paver stones, etc., are permitted as approved by the Engineer. When required by the Engineer, all public street improvements shall include a specific pavement design based on existing soil conditions and the recommended traffic volumes for the street's functional classification.

- **Street Pavements** – The street pavement sections shown in the Standard Details are typical and are comprised of PCC or HMAC with crushed rock base on compacted subgrade soil. Treated subgrades in the pavement section are also acceptable as approved by the Engineer.
- **Soil Tests** – Conduct two soil tests for projects that have 500 feet or less of new street. An additional soil test may be required for each additional 500-foot section. For asphalt pavements, conduct soil testing to determine the design subgrade resilient modulus (Mr) within the top 2 feet of the proposed subgrade elevation.
- **Design Life** – The design life of all new roads shall be 20 years or better.
- **Design Procedure for Asphalt Pavements** – The design procedures contained in the following references are preferred:

AASHTO Guide for Design of Pavement Structures, current edition – American Association of State Highway and Transportation Officials

Thickness Design – Asphalt Pavements for Highways and Streets, current edition – The Asphalt Institute

- **Design Procedure for Concrete Pavements** – The design procedures contained in the following references are preferred:

  AASHTO Guide for Design of Pavement Structures, current edition. (FHWA funded Capital Improvement Projects (CIP) shall solely use this guide.)

  Thickness Design for Concrete Highway and Street Pavements, current edition – Portland Cement Association

- **Minimum Thickness** – The thickness designs specified in the Standard Details are minimums. Actual pavement thickness may be based on specific pavement designs as approved by the Engineer.

- **Treated Base Materials** – For asphalt pavement sections that include a cement treated base (CTB), specify a finish surface pavement of not less than 3 inches of asphalt concrete.

Pavement design shall take into account the topography and include subsurface drains and/or geotextiles as required.

6.02.08 DESIGN SPEED

Design speeds for classified streets shall be as follows:

Table 6.02.08 DESIGN SPEED

FUNCTIONAL CLASSIFICATION	DESIGN SPEED*
Major Arterial	45 mph
Standard Arterial	40 mph
Minor Arterial	35 mph
Major, Standard, & Minor Collector	30 mph
Local Industrial/Commercial/ Transitional/Queuing Streets	25 mph
Minor Access Street/Alley	15 mph

* The posted speed shall be 5 mph lower for arterial streets and at design speed for all lower functional classifications.

6.02.09 HORIZONTAL CURVES

Horizontal curve radius (on centerline) for each street's functional classification shall be designed according to the roadway design speed. The radius shall not be less than the following:

Table 6.02.09 HORIZONTAL CURVE RADIUS	
DESIGN SPEED (MPH)	**RADIUS (feet)**
15	100
25	180
30	300
35	450
40	670
45	900

Traffic-calmed local roads that are designed to self-enforce lower speeds, may use a centerline radius as low as 50 feet with the Engineer's approval. Such roads shall be limited to low-density residential developments with a maximum of 50 dwelling units and 500 ADT. Maximum distance between speed control points shall be 500 feet. Speed control points include horizontal curves with 50-foot to 100-foot radii, traffic circles, textured pavement sections, or other similar traffic calming devices. The use of speed bumps is discouraged.

6.02.10 VERTICAL CURVES

Vertical curve length shall be based on the design speed and either stopping sight distance for crest curves or headlight and stopping sight distance for sag curves. All vertical curves shall meet AASHTO design criteria and be parabolic. Vertical curves are required for any centerline profile grade change of 2% or greater on Major and Standard Arterials and 2.5% or greater for all other street functional classifications.

6.02.11 GRADES

Maximum grades for each street functional classification shall be as follows:

Table 6.02.11 MAXIMUM GRADE	
FUNCTIONAL CLASSIFICATION	**MAX. GRADE**
Major/Standard Arterial	6%
Minor Arterial	8%
Major/Standard/Minor Collector	10%
Local Industrial/Commercial/Transitional	12%
Local Queuing	12%
Minor Access/Alley	12%

Local streets may exceed a grade of 12%, but in no case are permitted to exceed 15%. The Engineer may approve a grade greater than 12% when all the following conditions exist:

A. Topographic constraints do not allow the development to be served by a street with a maximum grade of 12% without causing destabilization of soils by excessive cuts and fills.

B. There is no access to the property being developed through adjacent properties at a maximum 12% grade.

C. The section of local street being designed will not exceed a combination of length, horizontal alignment, or grades exceeding 12% that will create hazardous traffic conditions.

For unsignalized intersections, keep the longitudinal grade on stop-controlled approaches below 8% for an approach distance of 50 feet.

Minimum grade for all streets shall be 0.50%. In all cases street grades shall allow for proper and adequate drainage. Cul-de-sac “bulbs” shall have a minimum slope of 0.60%.

6.02.12 CONCRETE CURB

All street improvements will be constructed with monolithic curb and gutter, as shown in **Standard Detail 620**. Type ‘C’ curb, as shown in **Standard Detail 621**, may only be used when the longitudinal street grade is 1.0% or greater or where cross slope of roadway drains away from curb, such as with raised median construction, and when necessary to match existing curb type.

6.02.13 INTERSECTIONS

Connecting street intersections shall be located to provide for traffic flow, safety, and turning movements as conditions warrant. Where signalization is approved, design shall provide for optimal signal phasing. Pre-approved materials and equipment are listed in the Gresham Pre-approved Materials Lists, which are available upon request. Designers shall consult with the Project Manager for layout and design requirements. Consideration is required for arterial street progression and permitted and protected/permitted left turn phasing. Proposals for new traffic signals in remote locations shall first include an evaluation of alternate traffic control methods, such as roundabouts.

Major, Standard, and Minor Arterial Intersections: Exclusive left-turn lanes will be provided; crosswalks will be provided at all approaches; street alignments across intersections shall be continuous.

Major, Standard, and Minor Collector and Local Street Intersections: Street and intersection alignments should facilitate local circulation but avoid alignments that encourage non-local through traffic. When a collector street intersects with an arterial street a left-turn lane, sized to provide queue storage for a 20-year horizon, is required.

Streets shall be aligned to intersect at right angles (90°). Angles of less than 70° will not be permitted. Intersection of more than 2 streets at one point will not be permitted.

New streets shall align with existing street intersections so that centerlines are not offset, except as provided in the table below. Where existing streets adjacent to a proposed development do not align properly, conditions may be required of the development to correct this misalignment. For intersections that are not directly aligned with street centerlines, the centerline spacing must meet the following minimum separation distance:

Table 6.02.13 INTERSECTION SPACING	
STREET FUNCTIONAL CLASSIFICATION	**INTERSECTION SPACING (feet)**
Major Arterial	500*
Standard Arterial	400*
Minor Arterial	300*
Major, Standard, Minor Collector	150
All Local street sections	100
* The Engineer may permit a minimum spacing of not less than 300 feet (Major Arterial), 200 feet (Standard Arterial), 200 feet (Minor Arterial) when findings are made to establish that:	
Notes:	
1. Without the change there could be no public street access from the parcel(s) to the existing street, or	
2. The change is necessary to support local pedestrian/bicycle circulation and access; and the change is necessary due to topographic constraints; and all other provisions of the street design requirements can be met.	

6.02.14 CURB RETURN RADIUS

Curb extensions and/or special crosswalk/sidewalk features designed to enhance pedestrian safety may be required to encourage pedestrian usage.

The standard curb return radii between intersecting streets are shown in the table below. When two streets with different classifications intersect, the curb return radii are based on the lower classification of the two intersecting streets. For example, if a Major Arterial intersects a Standard Collector, the curb return radius for the four intersection corners should be 25 feet.

Table 6.02.14 MINIMUM CURB RETURN RADII AT EDGE OF PAVEMENT/CURB FLOW LINE	
LOWER FUNCTIONAL CLASSIFICATION OF TWO INTERSECTING STREETS	**MINIMUM CURB RETURN RADIUS (feet)**
Major Arterial	30
Standard Arterial	30
Minor Arterial	25
Major, Standard & Minor Collector	25
Local Industrial/Commercial/ Transitional	20
Local Queuing	20
Minor Access Street/Alley	15

If a bicycle lane or on-street parking exists, the above turning radii may be reduced by 5 feet.

The Engineer will provide direction if a curb return radius at a specific intersection needs to vary from standard. Streets with heavy truck movements may require the installation of larger curb return radii than shown in the table. A smaller curb return radius may improve pedestrian accessibility in some cases. If the Engineer requires a developer to design a curb return radius larger than the minimum, the Engineer will identify the design vehicle to be used in the design. To accommodate safe

bus turning movements, streets with daily transit routes shall not have curb return radii of less than 25 feet.

6.02.15 PARKING

For parking requirements, refer to the Standard Details for the appropriate functional classification.

For streets designated Minor Arterial and below, the Engineer may require design modifications to conserve major trees in the public right-of-way and to further the goals set in Council Resolution 2267 for tree preservation. Subject to approval by the Engineer, parking lanes may be removed on one or on both sides of a street.

6.02.16 LOCAL STREET DESIGN FOR ADVERSE TOPOGRAPHY

Local streets shall have a cross-section slope of 2.0% downward toward the curb with the peak of the cross-section along the centerline ("crown"), except in situations of adverse topography. When approved by the Engineer, the Engineer of Record may utilize an "offset" or unequal crown section when the existing ground slope exceeds 8.0% across the roadway section.

The offset crown design shall meet the following conditions:

A. Minimum distance from "crown" to (one) face of curb is 10 feet.

B. Maximum cross-slope of pavement is 5.0%, except for horizontal curves. On horizontal curves, maximum reverse superelevation is 2.0%.

C. Maximum differential in top of curb elevation from one side to the other is 1 foot.

The existing ground "side-slope" criteria are based on the relationship of the slope of the ground to the transverse slope of the roadway profile. This relationship shall be met for the entire length of the roadway alignment utilizing an offset crown.

6.02.17 STREETLIGHTING

Design and installation of a complete streetlighting system shall be the responsibility of the developer for all streets fronting the property, including multi-use paths associated with the development. Developments will be required to submit a lighting plan that provides pole spacing less than or equal to the maximum spacing shown in **Table 6.02.17**. The spacing shall be measured from the center of each pole. If the proposed street grade exceeds the maximum grades shown in **Subsection 6.02.11**, the spacing shown in **Table 6.02.17** is not applicable and a site-specific photometric analysis will be required. See Project Manager for requirements.

Streetlights and streetlight infrastructure shall conform to the Standard Details. Streetlights per **Standard Detail 645, Decorative Acorn Streetlight**, are required on designated boulevards in the Pleasant Valley and Springwater Plan Districts. At the Engineer's discretion, infill development may meet requirements for streetlighting by installing new lights on existing utility poles per **Standard Detail 647**. If spacing of utility poles is substandard, additional underground-fed lights may be required along the frontage to meet lighting standards.

Streetlights are required to be installed along both sides of the street for arterials and streets within designated centers. For developments along arterial streets, where streetlighting is already provided on the other side of the street, streetlighting must be provided on both sides of the street.

Streetlight power for new lighting shall be supplied from underground. At the Engineer's discretion, the electrical conduits installed for streetlighting shall be extended to a junction box installed in the last panel of sidewalk at the property line to support future development.

The City standard for 35-foot poles is shown in **Standard Detail 644, Aluminum Davit Streetlight**. The standard for 25-foot poles is shown in **Standard Detail 643, Fiberglass Streetlight**.

All streetlighting materials and equipment installed in the public right-of-way must be listed on the City of Gresham Pre-Approved Materials List for Streetlight Equipment and Materials, with exceptions made at the Engineer's discretion. The City of Gresham Pre-Approved Materials List is available for download on the City's website.

(See table on the following page.)

Table 6.02.17 STANDARD STREETLIGHT LAYOUT AND TYPE					
FUNCTIONAL CLASSIFICATION	**LIGHT HEIGHT (FT)**	**STREET SIDE**	**MAXIMUM FRONTAGE SPACING (FT)**	**LUMINAIRE TYPE[4]**	**WATTAGE LEVEL**
Major Arterial[1]	35	Both Sides[2]	150	Medium Cobra	High
Standard Arterial[1]	35	Both Sides[2]	150	Medium Cobra	High
Minor Arterial[1]	35	Both Sides[3]	160	Medium Cobra	Medium
Major Collector[1]	35	Staggered[6] or One Side	170	Large Cobra	Low
Standard and Minor Collector[1]	25		120	Medium Cobra	Medium
Local Industrial[1]	35		185	Large Cobra	Low
Local Commercial[1]	25		130	Medium Cobra	Low
Local Transitional[1]	25		150	Small Cobra	Medium
Local Queuing[1]	25		150	Small Cobra	Medium
Pedestrian Paths	12		60	Small Cobra	Low
Shared Street	14	Staggered[6]	50	Acorn[5]	Low
Civic Neighborhood					
Standard Arterial	18	Both Sides	85	Pendant	High
Standard Collector	14		110	Acorn	Low
Civic Connector	18		100	Pendant	High
Civic Local	14		120	Acorn	Low
Downtown					
Downtown Boulevard	16	Both Sides	100	Acorn	Medium
Non-Boulevard Streets in Downtown	14		110	Acorn	Low
Rockwood Design District					
Boulevard	18	Both Sides	85	Pendant	High
Local Streets Inside the Triangle[8]	18		100	Pendant[7]	Low
Local Streets Outside the Triangle[8]	14		110	Acorn	Low
Designated Centers in Pleasant Valley and Springwater					
Standard Arterial	16	Both Sides	120	Acorn	Medium
Minor Arterial	16		110	Acorn	Medium
Major Collector	14		105	Acorn	Low

[1] Only applies to streets outside of the designated centers in the Downtown and Civic Neighborhood Plan Districts, the Rockwood Town Center portion of the Rockwood Design District, and the designated centers within the Pleasant Valley and Springwater Plan Areas.

[2] For Major Arterial and Standard Arterial frontages where streetlighting isn't currently provided or where lighting is currently provided only on the development's side of the arterial street, Extra-Large Cobra Head luminaires with High wattage shall be installed at 150-foot spacing and 35-foot light height.

[3] For Minor Arterial frontages where streetlighting isn't currently provided or where lighting is currently provided only on the development's side of the arterial street, Large Cobra Head luminaires with Medium wattage shall be installed at 160-foot spacing and 35-foot light height.
[4] See Gresham Pre-Approved Materials List for luminaire models for the listed luminaire types.
[5] Light poles may not be more than 10 feet off the right-of-way lines.
[6] If lights are installed on both sides of the street in a staggered pattern, the maximum frontage spacing may be double what is shown in **Table 6.02.17**.
[7] If overhead utilities have not been moved underground at the streetlight installation location, a Decorative Acorn Streetlight may be installed in place of the required Decorative Pendant Streetlight. A payment of cash in lieu for the cost difference between the Pendant and Acorn poles and luminaire fixtures must be provided to City for each substitution.
[8] The Rockwood Triangle Area per *GCDC Section 7.0500* is defined as the area bound by Stark Street on the south, Burnside on the north, 181st on the west and 190th on the east.

New streetlight poles shall be installed with their centers placed 30 inches from the face of curb. Lights shall be no closer than 15 feet to a street tree trunk.

All new installations with power supplied underground shall include a service disconnect between the PGE power supply and the first streetlight junction box, as shown in **Standard Detail 649**, unless otherwise directed by the Engineer. In developments where there are fewer than four streetlights, the service pedestal may be replaced with a fused disconnect in a junction box and a separate PGE Type 1730 junction box installed between the PGE transformer and that fused disconnect junction box.

Each service pedestal may have multiple lighting circuits. Copper conductor with a minimum wire size of #8 AWG are required for lighting circuits until the wire reaches the hand hole in the light pole. Wire inside the light pole shall be #10 AWG. For each circuit using copper #8 AWG wire, the total length of the circuit (one-way in feet) multiplied by the total load (in Watts) shall not exceed 1,105,750. The total load for each circuit must include the largest available system wattage for each light fixture. If the proposed circuit exceeds the allowable limit specified above, an additional circuit shall be utilized. The Project Manager may require developer to submit detailed voltage drop calculations for lighting systems with 15 or more lights.

6.02.18 Street Trees

Street trees in the public right-of-way, or within the setback and/or buffer area immediately adjacent to the right-of-way, will be required of all developments. A copy of the City's *Approved Tree List* can be found on the City's website. The particular species will be reviewed and approved as part of overall project submittals. A deposit for street trees to assure installation of the trees prior to occupancy may be required at the time of building permit issuance.

Minimum caliper of street trees shall be 1¾-inch. New street trees shall not be planted within the clear vision area or the adjacent right-of-way. All street trees shall have a minimum branch clearance of 8 feet above the centerline elevation of the intersection. Lower branches will need to be removed in successive years to provide a 14-foot clearance over arterial and collector streets, a 12-foot clearance over all other street functional classifications and 8-foot clearance over sidewalks. Newly-planted trees shall be securely staked for the first 2 years after planting and shall be replaced if they die or are destroyed. If a tree dies and needs to be replanted, the warranty period begins again from the date City staff verifies the tree has been replaced. Trees should be planted while they are dormant which is generally between October and April. For additional standards relating to street tree planting, see **Standard Detail 642.**

Table 6.02.18 STREET TREE FRONTAGE REQUIREMENTS			
FUNCTIONAL CLASSIFICATION	**TREE SPACING***	**MINIMUM TREES ALONG FRONTAGE FOR INTERIOR LOTS (EXCEPT FLAG LOTS)**	**MINIMUM TREES ALONG FRONTAGE FOR CORNER LOTS**
Non-Residential Areas			
All	30	N/A	N/A
Residential Areas (Not Including Single-Family Attached Dwellings)			
Arterial	30	2	3
Collector	30	2	3
Local**	30	N/A	N/A
Minor Access	30	N/A	N/A
Residential Areas (Single-Family Attached Dwellings)			
All	N/A	1	2
*Does not include the frontage that is driveways or clear vision area. Trees shall be minimum 20 ft, maximum 40 ft spacing.			
**Trees shall be planted every 30 ft along the outer curve of cul-de-sac right-of-way.			
Notes:			
1. Spacing required may vary depending on site and/or topography constraints.			
2. No street trees shall be planted in the right-of-way within 12 feet of the nearside of the crosswalk on the vehicular approach side of the street at street intersections.			
3. Street trees shall be located at least 15 feet from streetlights and stormwater catch basins and at least 5 feet from driveway cuts and underground utilities.			

Street trees being removed from the public right-of-way require a street tree removal permit and shall be cut flush with the ground surface or the stump shall be ground in place.

6.02.19 Street Names and Traffic Control Signage

Street names for all new developments will be assigned and approved by the City Addressing Coordinator prior to recording of any maps or plats.

The development shall pay for all street name and traffic control signage prior to the signing of the final plat or map. In general, all new signage will be installed by City staff.

6.02.20 Pavement Markings

All pavement markings shall be designed and installed in accordance with the current editions of the ODOT Traffic Line Manual and the MUTCD, including the Oregon Supplements to the MUTCD.

Paint is allowed for line striping only. Where line striping is within 75 feet of an intersection, thermoplastic material shall be used. All other markings, including arrows, stop bars, crosswalks, bike lane symbols, railroad crossings, and word legends, must be pre-formed thermoplastic material. The City requires specific styles of some of these thermoplastic markings, so only those markings listed in the City of Gresham Pre-approved Materials List may be installed.

For all channelizing lines and where crossing the lane line markings is discouraged, the line markings shall consist of a wide solid white 8-inch line. If yield lines are used, they shall have a base width of 12 inches, a height of 18 inches and be spaced 12 inches apart from each other. All stop bars shall be 12 inches wide and are not required when a marked crosswalk is present. All crosswalks shall be the staggered continental type, per ODOT standards, with each bar being 24 inches in width, 8 to 10 feet in length, and placed to avoid wheel paths. If an intersection is required to remain clear, a white word message stating DO NOT BLOCK, shall be required within the intersection area that

vehicles must not block. Pavement words, symbols, and arrow markings shall all be elongated, per ODOT standards. Where speed hump markings are required, use Option A markings per the MUTCD.

Temporary pavement markings shall be foil-back tape and flexible pavement markers, only if the expected time period for use is less than one month and in areas where traffic will not subject them to heavy wear. Painted pavement marking will be permitted if the time period does not exceed one year.

6.03 DRIVEWAYS

Access to private property shall be permitted with the use of driveway curb cuts where curbs exist and with asphalt concrete connections where no curbs exist. The access points with the street shall be the minimum necessary to provide access while not inhibiting the safe circulation and carrying capacity of the street. Driveways shall meet all applicable ADA regulations.

One driveway per site frontage will be the normal maximum. Double frontage lots and corner lots may be limited to access from a single street, usually the lower classification street. Commercial developments with frontage greater than 250-feet may request an additional driveway if needed. If additional driveways are approved by the Engineer, a finding shall be made that no traffic hazard would result, impacts on through traffic would be minimal, projected travel demands indicate it is in the interest of good traffic operations, and adequate street frontage exists to meet the driveway spacing standards of this section. Restrictions may be imposed on driveways, such as limited turn movements, the requirement of shared access between uses, relocation or closure of existing driveways, or other access management actions.

In the following circumstances, a new driveway will not be allowed (measured to the driveway centerline):

A. Within 30-feet of any commercial property line except when it is a shared-use driveway serving 2 or more abutting properties;

B. Within 100-feet of the curb return of an intersecting Major or Standard Arterial street;

C. When adequate sight distance cannot be provided.

Residential curb cuts shall be a minimum distance from adjacent property lines such that driveway curb wings and ramped sidewalk do not encroach on adjacent properties, unless approved by the Engineer.

Table 6.03 DRIVEWAY APPROACH LOCATIONS (Minimum Distance from Driveway Centerline to Curb Return)

FUNCTIONAL CLASSIFICATION	RESIDENTIAL	COMMERCIAL/INDUSTRIAL
Major Arterial	100 feet[1,3]	100 feet[1]
Standard Arterial	100 feet[1,3]	100 feet[1]
Minor Arterial	45 feet[3]	100 feet[1]
Major, Standard, Minor Collector	45 feet[2,3]	100 feet[1]
Local Transitional, Industrial, Commercial	45 feet[2]	45 feet
Local Queuing	45 feet[2]	
Minor Access Street	45 feet[2]	

Notes:

1. Minimum distance from curb return unless this prohibits access to the site.
2. Corner lot driveways on a frontage that is less than 75-feet shall be located no more than 7-feet from the interior property line and shall be no more than 24-feet wide.
3. Direct access to this street may not be allowed if an alternative exists or is planned.

All driveway approach widths shall be a minimum of 9 feet wide. Residential driveway approaches shall be a maximum of 24 feet wide but may be increased to 28 feet for 3-car garages. Commercial, industrial and multi-family driveway approaches shall be a maximum of 36 feet wide.

Driveways entering onto Arterials adjacent to street intersections shall be located beyond the prevailing queue length for traffic movements on that approach to the intersection. If this requirement prohibits access to the site, a driveway with restricted turn movements may be required.

For commercial, industrial, and multi-family developments, shared driveways and internal access between similar uses are encouraged and may be required to reduce the access points to the higher classified roadways, to improve internal site circulation, and to reduce local trips or movements on the street system. Shared driveways or internal access between uses shall be required and will be established by means of common access easements at the time of development.

6.04 SIDEWALKS

In general, new sidewalks with curbs are required for all development requiring a development permit. Sidewalks shall be buffered from the roadway by a planter strip to provide for the safety and comfort of pedestrians and shall comply with ADA regulations.

6.04.01 SIDEWALK WIDTH

Sidewalk width shall be provided as shown in the Standard Details. Streets with the Boulevard overlay require 9-foot wide sidewalks and streets with the Multi-Use Path overlay require 14-foot wide sidewalks on one or both sides.

Sidewalks shall be installed such that back of walk is 6 inches inside the right-of-way, except where buildings abut the right-of-way, in which case the sidewalk will be widened by 6 inches to abut the building.

In order to accommodate existing trees or similar circumstances, sidewalks may meander within the dedicated right-of-way or outside of the right-of-way within an easement with the approval of the Engineer.

Sidewalks shall have a maximum cross slope no greater than 1.5%. Sidewalks shall be constructed with a minimum 5-foot-wide continuous passage clear of all obstructions, including poles, mailboxes, signposts, and street furniture. Only with the Engineer's approval, may utilities locate above ground facilities in the sidewalk. In no circumstance shall there be less than a 48-inch horizontal clearance. An 8-foot vertical clearance above the sidewalk shall be maintained.

Handrails or fences must be installed at the back of the sidewalk to protect pedestrians when there is a vertical drop of 30 inches or greater adjacent to the sidewalk.

6.04.02 SIDEWALK RAMPS

New street intersections shall incorporate two sidewalk ramps per corner, unless approved otherwise by the Engineer. Retrofits shall incorporate ramps that line up with existing ramps. Where curb ramps do not exist opposite the new ramps proposed as part of new frontage construction, new ramps shall be constructed on the opposite side of the street in addition to the new ramps constructed as part of the frontage. If there is no sidewalk opposite the proposed frontage construction, no new ramps are required to be installed on the opposite side of the street. All curb ramps shall be built per **Standard Detail 624, Sidewalk Ramp,** and shall meet applicable current ADA regulations.

The placement of sidewalk ramps shall consider the direction of stormwater flows, the location of above-ground and below-ground utilities, and street grades. Other factors may also dictate sidewalk ramp location.

In areas of existing steep terrain, the Engineer encourages the Engineer of Record to utilize existing code provisions to eliminate sidewalk on one side of the street when permissible. This is permitted by development code and will reduce the overall number of ADA ramps. However, designer will need to provide continuity in the pedestrian network.

The Project Manager will review crosswalk cross slopes on construction plans as follows:

- For street grades of less than 8%, crosswalk cross slopes shall not exceed 1.5%.
- For street grades equal to or greater than 8%, crosswalk cross slopes of up to 5% will be permitted if considered reasonable in the engineering judgment of the City.
- Crosswalk cross slopes greater than 5% may be proposed in cases of technical infeasibility and will only be permitted if considered reasonable in the engineering judgment of the City.

The Engineer will not approve crosswalk cross slope more than 1.5% in advance of the submittal of construction plans. Written construction plans must be submitted to, reviewed, and approved by the Engineer prior to construction.

There may be rare cases in which circumstances justify a cross slope greater than 5%. The Engineer will permit such cross slopes only if, in the exercise of the Engineer's reasonable engineering judgment, the Engineer determines that there are no other practical alternatives. The following considerations will apply to the exercise of reasonable engineering judgment by the Engineer:

- For cross slope of greater than 5%, the Engineer of Record must state that every effort has been made to design a project with 5% cross slopes. Rough plans showing 5% cross slopes must be submitted with additional information to identify why the plan is not a practical alternative.
- Engineer approval shall include a disclaimer that the Engineer's approval will not act as an agreement or obligation to indemnify anyone if an ADA violation is alleged.
- The Engineer will consider the following factors in determining whether allowing a cross slope greater than 1.5% is a reasonable exercise of engineering judgment:
    - Street grades and width
    - Anticipated vehicle speeds
    - The nature of intersection controls
    - Alternative accessible routes
    - Permitted land uses in the area
    - Impact on natural resources

The engineering judgment will be documented by the Engineer of Record and approved by the City. If the cross slope exceeds 5%, the Manager's approval of the engineering judgment must also be obtained. See **Standard Detail 624, Sidewalk Ramp,** for additional details.

6.04.03 Asphalt Transition Sidewalk Ramps

Discontinuous segments of new sidewalk, which have been installed as part of required frontage improvements along otherwise unimproved roadways, shall have their ends connected to the fronting roadway pavement with ADA-compliant asphalt transition ramps. A 6-foot segment of new

frontage curb may be omitted to facilitate the construction of the ramp if there is no right of way available at the end of the new sidewalk.

The requirement for asphalt transition sidewalk ramps is waived for segments of new sidewalk that are shorter than 75 feet, are mid-block, and are disconnected from any existing sidewalk.

6.05 PEDESTRIAN/BICYCLE FACILITIES

6.05.01 BICYCLE FACILITIES

The City has adopted guidelines for bikeways based on the latest edition of the following:

A. AASHTO, "Guide for the Development of Bicycle Facilities"

B. ODOT, "Oregon Bicycle and Pedestrian Plan"

C. Manual on Uniform Traffic Control Devices with Oregon supplements by Oregon Transportation Commission

D. National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide

E. NACTO Urban Street Design Guide

6.05.02 MULTI-USE PATHS AND TRAILS

All rights-of-way for multi-use paths and trails shall be dedicated to the City for public use or may be approved as public access easements on private property.

Right-of-way or easement width for multi-use paths shall be 20 feet. Right-of-way or easement width for multi-use trails shall be 10 feet.

A clear-vision area, as specified in *GCDC Section 9.0200*, shall be provided at path and trail intersections with the street network. On-street parking shall be prohibited within 15 feet of the intersection of a path or trail and a public street to preserve safe sight distance. For developments with discontinuous segments of a multi-use path, an asphalt transition ramp shall be installed per **Subsection 6.04.03**.

GCDC may require buffering, fencing, screening, lighting, or other path and trail features.

The construction of stairways shall be avoided whenever possible. Where the path grade would exceed 12% slope, a path will be constructed as stairs for pedestrians. Based on local conditions, the Engineer may approve alternatives to stairs, including the use of switchbacks and alternative materials. If stairways are needed, they shall be at least 5 feet wide with handrails on both sides.

Multi-use paths and trails shall be designed to prohibit unauthorized motorized traffic.

When drainage, such as side ditches, is required parallel with the path or trail, the ditch centerline shall be at least 5 feet from the edge of the pavement and additional right-of-way or easement width may be required. Ditch side slope adjacent to the path or trail shall be no steeper than 2:1 when measuring the horizontal distance to the vertical distance. When multi-use paths or trails cross culverts, the ends of the pipe shall be no closer than 5 feet from the edge of the path or trail.

END OF CHAPTER

CHAPTER 7 - PARKS DESIGN

7.01 GENERAL DESIGN REQUIREMENTS

7.01.01 GENERAL

The development standards are not intended to cover every possible situation encountered during the design and construction of park facilities. The standards are intended to provide the flexibility to incorporate products and materials in an easy and consistent manner. Other designs and products may be submitted as variances and equals for approval.

Utilize well-qualified and experienced professional park designers for all planning and design.

Designs should comply with the latest edition of the Crime Prevention through Environmental Design (CPTED) concepts and strategies, which is available from the City of Gresham's Police Department.

It is essential that park development be consistent for the ease of maintenance and quick approval of products for our parks, trails, and other recreational facilities.

7.01.02 PARK STANDARD DETAILS AND SPECIFICATIONS

Assemble and install all products in accordance with the manufacturer's recommendations, as modified or shown on the drawings, and as approved by the City. Obtain approval of layout/location from the City prior to installing.

7.01.03 ADDITIONAL TECHNICAL SPECIFICATIONS

In addition to the technical specifications in these ***Public Works Standards***, the following additional technical specifications are incorporated herein by reference for the development of Gresham's parks, trails, and natural areas. The additional technical specifications are listed below as per the Construction Specifications Institute (CSI) standard titles. If a conflict exists between these ***Public Works Standards*** and the referenced CSI standards, the ***Public Works Standards*** will take precedence.

DIVISION 2 SITE WORK

Section 02100 – Site Preparation/Demolition
Section 02710 – Subsurface Drainage System
Section 02780 – Concrete Unit Pavers
Section 02795 – Porous Pavement
Section 02810 – Irrigation
Section 02810 – Temporary Irrigation
Section 02830 – Chain Link Fences
Section 02910 – Tree, Shrub, and Groundcover Transplanting
Section 02930 – Seeded Lawns
Section 02950 – Tree, Shrub, and Groundcover Planting

7.01.04 IRRIGATION SYSTEM SUBMITTALS

Photocopy the Irrigation Valve Schedule from the as-built plan (with any revisions noted). Laminate both sides of the copy with plastic and tape inside the controller. Provide equipment operating instructions, parts lists, service manuals, specification sheets, warranty information, winterization

instructions, precipitation rates per hour, and circuit operating time for each zone. Punch and place all materials in a 3-ring binder. Submit to Owner's Representative for review. Deliver to owner after Owner's Representatives' approval.

The contractor shall conduct a training and orientation session covering the operation, adjustment, and maintenance of the irrigation system. Contractor shall be responsible for one full winterization and one spring activation of the sprinkler system including backflow test and any repairs and shall conduct these operations as part of the owner's training and orientation procedures.

Irrigation product standards are found in **Subsection 7.06.03**.

7.02 PLANNING PROCESS

7.02.01 DEVELOPER CONSTRUCTED PARKS

Applicability

Before design and construction, a site-specific Park Master Plan may be required at the discretion of the City, typically for larger neighborhood parks or community parks. Developers should contact the City early in project development to determine if a site-specific Park Master Plan will be required. If so required, the effort may be led by the City prior to design and construction by the developer.

If a site-specific Park Master Plan is not required by the City, a developer may proceed directly with the process below.

If a developer wishes to receive Park System Development charge (SDC) credits, the project must be identified in the Parks System Development Charges Methodology project list.

Process

The following is the required process:

A. (1) If a park is proposed as part of a development permit application, the development permit must include the park location and size. Once the development permit is approved and the appeal period has passed, Developer shall schedule a pre-design meeting with staff to review, discuss and agree upon goals for the park per the ***Public Works Standards*** as well as the current Parks & Recreation, Trails & Natural Areas Master Plan, the Pleasant Valley Public Facility Plan, the Springwater Public Facility Plan, and the site-specific Park Master Plan (Applicable Plans).

   (2) If the proposed park is not part of a development permit application, Developer shall schedule a pre-design meeting with City staff to review, discuss and agree upon goals for the park per the ***Public Works Standards*** and the Applicable Plans.

B. Developer shall prepare a Conceptual Site Design by a licensed design professional. Developer shall schedule a meeting with the City for review of the Conceptual Site Design. An electronic PDF file of the Conceptual Site Design, along with a short-written statement and cost estimate, shall be submitted to the City at least 3 weeks prior to the meeting.

C. After the City and Developer agree on the Conceptual Site Design, Developer shall hold a public meeting using the process described in the *Gresham Community Development Code's Early Neighborhood Notification Process (Section 11.0800)*. City staff shall be invited to the meeting. The public shall have 14 days following the meeting

to submit comments to the City and the Developer regarding the Conceptual Site Design.

D. Developer shall prepare construction documents (plans and specifications) and submit the documents to City of Gresham Permit Center for review and approval per the Development Code, the ***Public Work Standards***, Applicable Plans, and any applicable Building Codes. If additional land use permits are required, such as a tree removal or overlay permit, the construction plans will not be approved until these permits have been secured.

E. Parks SDC credits are provided when the public improvements are accepted for ownership and operation by the City or as otherwise provided by *GRC 11.05.060*. The City may allow credit release at completion of the Master Plan or Conceptual Site Design phases. With any release of credits, the City shall take full ownership of the work products for future use at its discretion.

F. The City may elect to waive some of these requirements if the City determines that the public involvement and land use processes were sufficient to notify and involve the neighborhood of the proposed park and of its Conceptual Site Design.

7.03 PARKLAND DESCRIPTIONS

The parkland managed by Gresham Parks and Recreation is generally categorized into six park types.

- Neighborhood Parks and Pocket Parks
- Community Parks
- Urban Plazas and Town Squares
- Natural Areas and Greenways
- Trails, Trailheads and Multi-Use Paths
- Regional Parks

Each park type offers a different experience and function. Developed park sites, within the system, offer space for active and intensive recreation, including sports fields, play equipment and ball courts. Natural areas and greenways are lands of natural quality set aside for protection of natural resources, nature-oriented outdoor recreation, and trail and trail-oriented activities.

The following are general guidelines. Each park development will be approved by staff based on what is appropriate for that specific site.

7.03.01 NEIGHBORHOOD PARKS AND POCKET PARKS

A neighborhood park generally serves nearby residents; enhances neighborhood identity; preserves neighborhood open space; and is within walking and bicycling distance (½ miles or less) of a person's home. They provide access to basic recreational opportunities for residents of all ages; and are designed primarily for non-organized recreation. They are typically 1-8 acres in size and may include restrooms and a skate park, but do not include parking lots, unless warranted by unique circumstances.

Neighborhood Parks include Pocket Parks in denser urban areas which are usually less than 1 acre in size.

Neighborhood parks often include amenities such as:

- Graded and seeded lawns

- Play equipment / children's play area for early childhood as well as youth ages 5-12
- Picnic areas, tables / picnic shelter / BBQ
- Benches
- Multi-use path system
- Automatic irrigation system
- Landscaping: trees, shrubs and lawn
- 8 foot x 8 foot backstop panel for children's games
- Hard court play area, such as volleyball, half-court basketball, or other sports facilities
- Security bollards and/or fencing
- Signage
- Restroom building
- Lighting
- On-street parking
- Bike racks
- Community gardens where space is available
- Trash cans and drinking fountain
- Public art
- Horseshoe pits
- Special gardens
- Skate park

Neighborhood parks typically do not include:

- Recreational facilities intended for large groups, i.e. sports fields
- Off-street parking

Examples:

- Yamhill Neighborhood Park
- Bella Vista Neighborhood Park
- Davis Neighborhood Park

7.03.02 COMMUNITY PARKS

Community parks provide a focal point and gathering place for broad groups of users and are used by all segments of the population. A community park generally serves the community within a 5-mile radius service area. They are typically 10-50 acres in size and are intended to serve a larger community need. Community parks provide access to active and passive recreational opportunities and accommodations for larger groups. They provide: a variety of accessible recreation opportunities for all age groups; environmental education; the recreational needs of families; and community social activities. Because of their large service area, community parks require more support facilities, such as larger restrooms and off-street parking.

Community parks often include amenities such as:

- Graded and seeded lawn areas
- Play equipment / children's play area for early childhood as well as youth ages 5-12
- Picnic areas, tables, picnic shelter, BBQs, and group picnic areas
- Benches
- Multi-use path system
- Automatic irrigation system
- Landscaping: trees, shrubs and lawn

- Recreation facilities for organized activities
- Competitive sports fields and facilities such as softball, baseball, or soccer fields
- Hard or soft play court areas, such as basketball, skateboard area, or volleyball
- Security bollards and/or fencing
- Signage
- Off-street parking lots, possibly with pull through bus parking
- Restroom building
- Community gardens
- Natural areas or botanical gardens
- Lighting
- Bike racks
- Trash cans and drinking fountain
- Passive recreation space
- Public art, fountains, interpretive facilities, and larger community facilities such as community centers, amphitheaters, festival space, and swimming pools
- Dog off leash area
- Skate parks

Additional programming and activities can be included within a community park. The City relies on the sports groups to construct, operate and maintain concessions at their expense.

Examples:

- Main City Park
- Pat Pfeifer Community Park
- Red Sunset Community Park
- Zimmerman Heritage Farm Community Park

7.03.03 URBAN PLAZAS AND TOWN SQUARES

Urban plazas are multi-purpose paved areas within high density urban developments and along transit corridors and include town squares. They are focal points of town center districts. Urban plazas provide for the day to day recreational needs of nearby residents and employees, as well as shoppers, transit-users, and recreationalists. They provide space for community events; help balance high density development; and communicate neighborhood character. They are expected to be relatively small, usually less than 1 acre in size.

They may include:

- A multi-use paved area
- Community green or garden
- Children's integrated play areas, such as climbable sculpture and boulders
- Public art and fountains
- Landscaping and irrigation
- Seating
- Multi-purpose performance space
- Small scale sports facilities, such as basketball hoops
- Signage
- Restroom building
- Trash cans and drinking fountain

Urban plazas usually do not include:

- Off-street parking
- Lawns

Examples:

- Pioneer Square, Portland
- Westlake Park, Seattle
- Union Square, San Francisco

7.03.04 NATURAL AREAS AND GREENWAYS

These are areas of natural quality for protection of natural resources, nature-oriented outdoor recreation, trail and trail-oriented activities. Open spaces include buttes, view points, and undeveloped natural areas. Greenways are linear open spaces along significant waterways, wetlands, seasonal streams, sloughs, river frontage or simply a continuous open area. Many Natural Areas and Greenways are forested or wetlands. They provide opportunities for rest and relaxation; protect valuable natural resources; protect wildlife; and contribute to the environmental health of the community.

Natural Areas and Greenways should have sufficient size to protect resources. They should have sufficient width and suitable topography to accommodate pedestrian or bicycle trails.

They may include:

- Trails
- Parking
- Restroom building
- Bike racks
- Trash cans and drinking fountain
- Picnic areas
- Benches
- Signage
- Outdoor classroom
- Native plants

Open Spaces and Greenways usually do not include:

- Facilities that do not directly support nature and trail oriented passive recreation
- Ornamental plants
- Lawns
- Parking within the greenway

Examples:

- Nadaka Open Space
- Butler Creek Greenway
- Gresham Butte Open Space
- Hogan Butte Nature Park

7.03.05 TRAILS, TRAILHEADS AND MULTI-USE PATHS

Paths are paved, off-street travel ways designed to serve non-motorized travelers. Trails provide both recreation and transportation routes through natural environments and urban areas. Trails

are not necessarily paved and tend to be more recreational in nature, serving a variety of activities including biking and hiking. Trailheads are an integral part of this system. They provide opportunities for rest and relaxation; provide opportunities for trail-oriented activities; reduce auto-dependency; and connect community facilities.

Trails and trailheads should have the appropriate size to protect the surrounding natural resources. Multi-use paths and trails shall meet the requirements of **Subsection 6.05.02** and **Standard Detail 626**.

Trails, trailheads and multi-use paths may include:

- Walk-in trailheads or access points
- Parking
- Restroom building
- Picnic shelter
- Picnic tables
- Lighting outside of important wildlife habitat
- Trash cans
- Drinking fountains
- Bike racks
- Benches
- Signage
- Structures
- Native plantings; and landscaping and automatic irrigation system for trailheads

Trails, trailheads and multi-use paths do not include:

- Ornamental plants
- Lawns

Trail and Trailhead Examples:

- Gresham Butte Saddle Trail
- Kelly Creek Greenway Trail
- Linnemann Station Trailhead
- Hogan Road Trailhead

Multi-Use Path Examples:

- Springwater Trail
- Gresham-Fairview Trail
- I-84 Bike and Pedestrian Path
- Wy' East Way

7.03.06 REGIONAL PARKS

Regional parks are recreational areas that serve residents from throughout Multnomah and Clackamas Counties and beyond. The regional park system consists primarily of conservation and habitat properties or large scale parks provided and managed by Metro regional government or county government. Regional parks are usually larger than 50 acres in size and provide opportunities for diverse recreational activities. Currently Gresham does not have a regional park.

Facilities may include:

- Sports fields

- Extensive trail systems
- Large picnic areas
- Large natural areas
- Boat Launch Facilities

In addition, regional parks often include passive recreation space and unique features, such as significant natural areas or access to lakes or rivers. Because of their large size and broad service area, regional parks typically require more support facilities, such as parking and restrooms. These parks are usually designed to accommodate large numbers of people.

Examples:

- Delta Park Sports Complex
- Oxbow Regional Park
- Blue Lake Regional Park

7.04 DESIGN REQUIREMENTS

7.04.01 GRADING

Design grass slopes no steeper than 3.5:1 to facilitate mowing of lawns. Steeper slopes should be planted in shrubs or possibly ground covers.

Limit the height and extent of mounds and berms to avoid creating hiding places.

7.04.02 PLANTING

As part of the park construction contract, contractor shall spray kill lawn and install 2-foot clear radius mulch circles around the outside of new and existing trees.

Place new trees 17 feet minimum from fence lines, buildings, other structures; and 12 feet minimum from sidewalks and roads to maximize lawn mowing efficiency; minimize root heave damage; and damage to trees.

Limit installation of new shrubs in areas other than main park entry points.

Avoid using plant material which will prohibit clean, clear sight lines. Avoid using shrubbery within the 3-foot to 6-foot height range. Avoid creating hiding places.

Long, gentle sweeping curves for lawn lines are preferred over short, abrupt changes in direction.

7.04.03 WATER, IRRIGATION, AND DRINKING FOUNTAINS

Quick coupling valves should be located less than 100 feet from play areas, play equipment, drinking fountains, restroom buildings, and shelters. A drinking fountain with an interior hose bib may be installed instead.

Irrigation designs should anticipate possible volume loss due to future adjacent development. Designers should contact the local water district to determine minimum available water pressure and flow for that area of the service district. Any private sprinkler (fire, irrigation) system or on-site private hydrant system needs to be designed to function at a pressure at least 10psi lower than the lowest expected pressure of the adjacent public water system.

Valve boxes should be located in shrub beds whenever possible. Pipes, sharing a trench, must be spaced a minimum of 2 inches apart. Install a locator tracing wire for all mainline pipes. As-

built plans must be provided for all irrigation systems in accordance with the *City of Gresham CAD Manual*.

Back flow devices must be installed a minimum of 24 inches, to the top of the device, below finish grade to protect from freezing as per building code requirements. Wherever possible this should also be the maximum depth. In some cases, when approved in advance, the Project Manager may allow a minimum of 18 inches from finish grade to the top of the device.

Backflow devices are to be positioned/rotated to allow clearance/access for inspections and repairs.

Do not install frost-resistant drinking fountains.

For installation of new water meters, install a minimum 2-inch service water line and a minimum 3/4-inch water meter.

7.04.04 LIGHTING

Lighting shall meet the standards set forth in **Subsection 6.02.17.**

7.04.05 DESIGNING FOR MAINTENANCE

Consider replacement costs, maintenance costs, and graffiti removal when selecting materials. Apply anti-graffiti coatings to applicable surfaces.

Do not use exposed aggregate concrete for paving, walls and site furnishings.

Use standard poured in place curbing in parking lots. Wheel stops and 6-inch x 6-inch extruded curbing are not acceptable.

7.04.06 STRUCTURES

Restroom fixtures, including sinks, toilets, hardware, and urinals, shall be stainless steel. Do not use spring loaded doors and seats. Restrooms should have a large utility chase room with a door to the outside. Chase door shall be on the same side of the building as the restroom doors. Restroom fixtures should use parts and brands that are locally and currently available. Only the toilet flush ignition button should be located within the restroom; with the activator located within the chase.

Shelter structures should be designed to seat approximately 50-100 people. Typical construction material is steel columns and roofs. Other materials may be used if approved by the Engineer. Shelters shall be simple and open with few opportunities for birds to nest or people to climb. Shelters shall have a strong gutter system with schedule 40 steel downspouts to direct stormwater, minimize vandalism and be designed for low maintenance and up keep. Concrete flooring is required unless otherwise approved by the Engineer. Metal parts shall be powder coated and the structure coated with an anti-graffiti coating.

Good examples of shelters are the 32-foot x 32-foot shelters at Red Sunset Park or the shelter at Main City Park, each of which provide seating for approximately 100 people.

Avoid providing routes and ways to access roofs of park structures. All new shelters shall include security cameras and video surveillance signs.

7.04.07 STAIRS AND BRIDGES

Do not include stairs unless otherwise explicitly approved by the Engineer.

Trail bridges shall be the same width as the trail, plus 18 inches on each side, and capable of similar use as the trail. Steel bridges with concrete or metal decking are required unless otherwise approved by the Engineer. Bridges should not be designed with columns in streams.

7.04.08 PLAY STRUCTURES

A City standard concrete curb shall be installed to contain the engineered wood chips used under and around play structures. Wood members shall not be used in play structures and decking should be of coated metal.

Green and blue have been standard Gresham park colors; however other colors may be approved by the Project Manager. Play structure colors should be naturalistic utilizing browns and green tones. Avoid garish bright colors.

7.05 SIGNAGE PROGRAM

Recommended signage types for park property includes:

1. One or more park site identification signs at main entrances
2. One or more park general regulatory signs at main entrances
3. Interpretive signage as desired and located near the resource of interest
4. Accessibility signage as required
5. Traffic and parking control signage as required
6. Dog enforcement code signs at park entrances
7. No Smoking signs
8. Restroom signs
9. Other signage as required

All signage shall be as per Park and City standards. Utilize metal break away posts on single post signs. See **Standard Detail 631.** Restroom signs include signs on all restroom doors stating that it is against *GRC 7.10.145* to remain in a locked or barricaded restroom for more than 30 minutes.

Recommended signage for specific park property types is listed below. Additional signage may be required by the City.

Table 7.05 RECOMMENDED SIGNAGE

PARK TYPE	SIGNAGE TYPE (see above)
Neighborhood and Pocket	1, 2, 4, 6, 7, 8
Community	1, 2, 4, 6, 7, 8
Urban Plazas and Town Squares	1, 2, 3, 6, 7, 8
Natural Areas and Greenways	1, 2, 3, 4, 6, 7, 8
Trails and Multi-Use Paths	1, 2, 3, 4, 6, 7, 8
Regional	1, 2, 3, 4, 6, 7, 8

7.06 PRODUCT STANDARDS

7.06.01 SITE FURNISHING PRODUCT STANDARDS

Other designs and products may be submitted for consideration as an approved equal per **Section 1.06**, **Approval Of Alternate Materials Or Methods**, of these Design Standards, and **Subsection 108.07**, **Trade Names, Equals, Or Substitutions**, of the Standard Specifications.

Table 7.06.01 SITE FURNISHING		
ITEM	**MANUFACTURER**	**MODEL NUMBER AND NOTES**
Barbecue:		
For picnic shelters & community parks: Group Barbecue	Pilot Rock	P-1000/S B7 B7 surface mount base, bolt down 1008 sq. inches, 215 lbs. Example: Red Sunset Community Park
For single family & neighborhood parks: Barbecue	Pilot Rock	B-24/SB2 w/ optional shelf B2 standard base, concrete embedded 384 sq inches, 91 lbs. Example: Red Sunset Community Park
Benches:		
Embedded Mount Bench	Pilot Rock	Model SCXB/G-6DW10 or SCXB/G-8DW10 Embedded mount 6-foot or 8-foot bench plastisol coated expanded steel back and seat Color: Brown
Renaissance bench w/ 3 armrests	Columbia Cascade	8-foot, surface mount; Solid steel
Parkway bench w/ 3 armrests	Columbia Cascade	2016-8-E-M 8-foot, Thermo plastic coated expanded steel
Tables:		
Extra Heavy Duty Portable Rectangular Table	Pilot Rock	Model XT/G-6DW or XT/G-8DW Portable 6-foot or 8-foot rectangular table with D-type thermoplastic coated expanded steel top and seats Color: Brown
Wheelchair Accessible Extra Heavy Duty Portable Rectangular Table	Pilot Rock	Model XT/G-6DW/E Wheelchair accessible rectangular table extended one end with D-type thermoplastic coated expanded steel top and seats Color: Brown
Parkway Table	Columbia Cascade	8-foot, continuity with Thermo plastic coated expanded steel Can be built as an accessible table with an overhang
Picnic Table	Natural Structures	Thermo plastic coated expanded steel
Bicycle Racks:		
Bicycle Rack	Columbia Cascade	Model 2172 (bollard type) Example: Linnemann Station Trailhead, Springwater Trail
TimberForm Cycloops embedded	Columbia Cascade	#2170-7G or C (approx. 5 foot-3 inch x 3 foot-0 inch)
Bollards:		
Bollard – Wood		Not acceptable

Bollard - Concrete		Might be approved for urban settings, provide details
Bollard – Embedded metal	Columbia Cascade	TimberForm #2190-E, Evergreen color Power-coated Example: Pat Pfeifer Community Park
Bollard – Removable metal	Columbia Cascade	TimberForm #2190-RC, Evergreen color Power-coated, provide sleeve cap Examples: Pat Pfeifer Community Park and Gresham-Fairview Trail Phase 1
Drinking Fountains:		
Drinking Fountain	Most Dependable Fountains, Inc.	Model 440SM w/ concrete pad, surface mount, emerald color, w/ recessed hose bib w/ lock door Example: Red Sunset Community Park
Concrete Drinking Fountain		Not acceptable
Pet Fountains	Most Dependable Fountains, Inc.	
Trash Receptacle:		
Trash Receptacle	Concrete Shop, Inc., Vancouver, WA	With Rubbermaid dome top Model SF034, smooth finish concrete, open bottom spring loaded door & metal ring to hold bag. Install per **Standard Detail 701** on concrete pad. Examples: Linnemann Station Trailhead, Springwater Trail
Basketball Equipment:		
Basketball Posts	Gared	GN 45 (1266-4 system) 4 ½ inch O.D. schedule 40 galvanized steel pipe, single post, 4' offset arch
Basketball Backboards	Gared	1266; Regulation 54 inch fan shaped, galvanized 12 gage reinforced steel plate, power coated white
Basketball Goal and Net	Gared	#266; goal comprised of 5/8 inch steel ring and ½ inch reinforcing ring, with 12 no-tie hooks for net, power coated orange
	Collegiate Pacific	Coated Cable
Baseball, Softball, Soccer, Football, Tennis, Skate Park Equipment:		
Aluminum Bleachers	Collegiate Pacific	Stationary Bleachers – Preferred Double foot planks on all rows
Backstop		
Children's Play Equipment and Safety Surfacing:		
Play Equipment	Landscape Structures & Ross Recreation	Model & color varies Examples: Pat Pfeifer and Main City Community Parks; Bella Vista and Butler Creek Neighborhood Parks

Drainage: Drain rock		6-inch min depth of 1 inch washed round drain rock
Safety Surfacing: Sof'Fall engineered wood fiber	Landscape Structures, Recreation Resource, Inc., & Ross Recreation	Example: Pat Pfeifer Community Park
or		
GT IMPAX engineered wood fiber	Site Lines Park & Playground Products	
Geotextile Fabric		Minimum of 28 mills thick and 26 gallons per square foot per minute permeability Example: Pat Pfeifer Community Park
Signage:		
Park Identification Sign	Gresham Sign Shop	Fabricated per photo, use graffiti film
Park Regulatory Sign	Gresham Sign Shop	Fabricated per photo, use graffiti film
Other signs	Commercial Sign Shop	Use graffiti film
Metal posts		2" square 14 gauge break away posts For single post signs see **Standard Detail 631.**
Trails and Walks:		
Interior Paved Walks and Trails		See **Standard Detail 626, Multi-use Path/Trail.**
Concrete Unit Pavers: (Stamped concrete shall be used whenever feasible in place of concrete pavers.)		
Double Soldier Course Edges, under benches, and Paver Bands:		
"Holland-Stone"	Willamette Graystone	(60 mm) thickness, 3.9" x 7.9", Charcoal color
Inner Field Pattern 6 / Muster K:		
"Holland-Stone"	Willamette Graystone	(60 mm) thickness, Walnut Blend color
Permaloc "StructurEdge" metal	Permaloc Corp.	1/8" x 2 ¼", black DuraFlex finish, 8-foot lengths
Snap Edge plastic edge restraint	Willamette Graystone	
Geotextile:		
AMOCO 4545 (non-woven)	A.C.F. West Inc.	
or		
Mirafi 600 X soil stabilization fabric	Willamette Graystone	
Bedding Course Sand:		Clean concrete sand, fine, sharp, non-plastic aggregate complying with ASTM C33; do not use mason sand. No material shall pass the No. 200 sieve
Joint Sand:		ASTM C144 except use aggregate graded with 100 percent passing the No. 8 sieve and 95%, the No. 16 sieve; no

		material shall pass the No. 200 sieve.
Paver Sealant: Techni-Seal "iN Sealant"		Invisible, water based and non-film forming; apply as per manufacturer's specifications
Paver Joint Filler: Techni-Seal "HP Polymeric Sand", Granite Grey		Install per manufacturer's specifications Example: Pat Pfeifer Community Park
Lighting:		
Parking Lot Lighting	Ameron Pole Products	VEF-6.1 (513A) Pole w/ Alum Tenon – PGE Brown Nat., Exp. Aggregate Finish w/ Gloss Coat Victorian Series Fluted Pole. Similar to Main City Park
Multi-use Path Lighting		See **Subsection 6.02.17** and Pre-Approved Materials List for Streetlight Materials and Equipment
Lawn Seed:		
CPR Perennial Ryegrass Blend		For parks & sports fields Example: Pat Pfeifer Community Park

7.06.02 RESTROOM PRODUCT STANDARDS

Table 7.06.02 RESTROOM PRODUCTS		
ITEM	**MANUFACTURER**	**MODEL NUMBER AND NOTES**
Complete Restroom*	CXT Precast Products	Cortez – Double flush restroom Examples: Rockwood Central Neighborhood Park and Pat Pfeifer Community Park
Complete Restroom*	Romtec	Sierra II – Double restroom with 8' storage and 2 roof extensions with exterior siding fixture package (cedar board & batten with stone veneer)
Complete Restroom*	Romtec	Sierra Stretch Quattro (quad restroom) – Title 24 w/4' center storage/mech. room with exterior siding fixture package (cedar board and batten with stone veneer)
* The City will determine which restroom or approved equal will be constructed at each park.		
Plumbing Fixtures:		
Urinal	Acorn 1705-ADA-W-1-SW-Q	Penal-ware
Urinal Flush Valve	Sloan Royal 952-FW	
Toilet	Acorn 1675-W-1-SW	Wall mount stainless steel
Toilet Mount		Behind wall carrier
Toilet Flush	Sloan Royal 952-FW	Flush valve
Toilet Seat	Olsonite	Open end solid plastic
Sink	Acorn 1652-ADA-1-LF-3-M-LW1-SW	Wall mount stainless steel

Floor Drains	Josam 30000 A series	6-inch interior floor drains
Drinking Fountains	Most Dependable Fountains, Inc	Exterior stainless steel wall mount
Exterior Hose Bib	Smith 5509qt	Exterior recessed stainless steel box
Cleanouts	Smith 4020	Flush mounted
Waterhammers	Smith series 5000	Hydrotrols hammer arresters
Pressure Regulator Valve	Wilkins 25-75 PSI	
Architectural:		
Toilet Paper Dispenser		Furnished by owner
HC Grab Bars	Cipco	Stainless steel surface mount vandal resist
Doors/Frames		Metal; 12-gauge steel with grouted frame
Locks	Best	
Kick Plate		Stainless Steel 10-inch x 35-inch
Push Plates		Stainless Steel 10-inch x 16-inch
Vents		Galvanized Steel
Electrical Components:		
Hand Dryer		Through wall mount
Chase Lights		Florescent fixture Example: Pat Pfeifer Community Park

7.06.03 IRRIGATION PRODUCT STANDARDS

Table 7.06.03 IRRIGATION PRODUCTS

ITEM	MANUFACTURER	MODEL NUMBER AND NOTES
PVC Pipe and Fittings:		
PVC Pipe (Polyvinyl Chloride Plastic)		PVC 1120, Type 1, normal impact, I.P.S., N.S.F. approved.; Schedule 40 pipe conforming to ASTM D1784-69, ASTM D1785, PS22-70; Class 200 pipe conforming to ASTM D1784-69, ASTM D2241, PS22-70; all pipes shall be new, defect free, and continuously and permanently marked with the manufacturer's name or trademark, size, schedule and type of pipe; minimum 200PSI rated and with SDR 21 walls
PVC Pipe Fittings		PVC 1120, Schedule 40 Type 1, normal impact, I.P.S., N.S.F. approved; meeting requirements of ASTM D2466
PVC Solvent Cement		Weld-On 721 meeting N.S.F. approval for Type I and II PVC through 6 inch and meeting requirements of ASTM D2564
PVC Cleaner and Primer		Weld-On P-68 or P-70 or meeting requirements of ASTM F656, purple color; one step glue with built-in primer is not acceptable
PVC Sleeves		Schedule 40; 4-inch min.

Galvanized Steel Pipe and Fittings		Schedule 40, hot dip galvanized, conforming to ASTM A120-76; fittings shall be malleable iron, hot-dip galvanized
Irrigation Heads	Rainbird or Hunter	Use rubber cap option on rotors in sports fields
Valves and Accessories:		
Automatic Control Valves		See valve schedule on drawings; supply and install PVC unions on both sides of valves (see details)
Ball Valves (full port)	Conbraco, Apollo 70 series, Watts, or Nibco	Brass or bronze, 400PSI min. with standard seat and threaded ports; stainless steel ball and stem; non-latching stainless steel lever handle (not latching or chrome plated or tee handle); same size as pipe or as indicated on drawings; Nibco requires contractor to replace zinc coated steel handle with the stainless steel handle; supply and install PVC male adapters or PVC nipples into valve, not galvanized nipples; supply and install PVC unions or flanges on both sides of valves
Gate Valves		200PSI min. cold working pressure; supply and install PVC adapters or PVC nipples into valve, not galvanize nipples; supply and install PVC unions or flanges on both sides of valves (PVC unions manufactured by KBI)
Gate Valves at P.O.C. and mainlines over 2½ inches in diameter	Nibco model MJF-619-RW-SON	Ductile iron, resilient wedge, non-rising stem, flanged end, square operating nut; size to match mainline
Gate Valves on mainlines less than 3 inches and at automatic control valves	Nibco model T-113-BHW	Domestic manufactured bronze, threaded ports, solid wedge, non-rising stem, round bronze hand wheel, dezincification resistant; size to match mainline and or valves
Drain Valves		Ball valves as described in second item above
Quick coupling valves:		
For potable water lines	Rainbird # 44LRC	Locking Rubber [yellow] Cap
For non-potable	Rainbird #44NP	This has a locking purple cap, which says “DO NOT DRINK!” in English and Spanish
Valve boxes:		For control, gate, and ball valves – 11-inch wide x 16-inch long x 12-inch deep with locking top, stainless steel bolts, and 3 inch and/or 6-inch extensions as needed to meet finish grade; install filter fabric under and around all valve boxes

Paver Blocks Under Valve Boxes		
Shrub Areas	Carson #1419-12	With stainless steel bolt and washers with #1419-4B bolt down tee lid, color deep green
Lawn Areas	Carson #1419-12	With stainless steel bolt and washers with #1419-4B bolt down tee lid, color deep green
Valve Box for Quick-coupling Valve:		10-inch round twist lock box
Shrub Areas	Carson #910-3B	With optional locking stainless steel bolt
Lawn Areas	Carson #910-3B	With optional locking stainless steel bolt
Other Materials:		
Keys		Two valve operating keys (heavy galvanized plate iron) length as needed to operate deepest valve(s) for systems that use manual zone valves
Low Voltage Control Wire		Color coded direct burial cable, solid copper, type UF, UL listed for direct burial in ground; use white for common wire, red for control wires, and blue for spares; size of wire shall be in accordance with manufacturer's recommendation, but in no case smaller than single strand number 14 gauge
Electrical Connectors	3M DBY	All wire connections and splices to be placed in a box
Pipe Backfill Material		Imported riverbank sand
Drain Rock		1½ inch round drain rock; no fines
Detector Tape	Allen Systems or Lineguard	2-inch wide blue metallic tape with permanent “Caution – Buried Waterline Below”
Permanent Waterproof Number Tags for Control Wires		
In Valve Boxes	Permatag	Aluminum tie-on markers
In Controller		Coated adhesive numbers labels
Swing Joints for Rotary Heads		Same size as head inlets
Irrigation Controller	Hunter	See drawings for controller model number
Backflow Preventer	Wilkens 950	
Backflow Preventer Valve Box		Size to match backflow with locking top, stainless steel bolts, and 3 inch and/or 6-inch extensions as needed to meet finish grade; install filter fabric under and around all valve boxes

END OF CHAPTER

Public Works Standards

STANDARD SPECIFICATIONS

DEPARTMENT OF ENVIRONMENTAL SERVICES

CITY OF GRESHAM, OREGON

CHAPTER 100 - GENERAL REQUIREMENTS

101 DEFINITIONS, ABBREVIATIONS, AND PRIVATELY FINANCED PUBLIC IMPROVEMENT REQUIREMENTS

The definitions provided by *Oregon Revised Statutes (ORS) Chapters 279A and 279C* and *Oregon Administrative Rules (OAR) Chapter 137 Divisions 46 and 49* apply to all projects that incorporate the ***Public Works Standards*** of the City of Gresham into the Contract Documents of a project. Unless otherwise defined by applicable law or the Contract Documents, the following definitions and abbreviations shall apply whenever used.

The words directed, required, permitted, ordered, requested, instructed, designated, considered necessary, prescribed, approved, acceptable, satisfactory, or words of like meaning, refer to actions, expressions, and prerogatives of the Manager.

Command type sentences are used but are not exclusive of other directives, throughout these Standard Specifications. In all cases the command expressed or implied is directed to the Contractor.

The Standard Specifications contained herein are divided into categories: (1) Chapter; (2) Section; and (3) Subsection, and are designated as in the following example:

(1) Chapter: **CHAPTER 200 – GENERAL TECHNICAL REQUIREMENTS**

(2) Section: **206 EXCAVATION, EMBANKMENT, BEDDING, AND BACKFILL**

(3) Subsection: **206.02 Materials** or

206.02.05 Select Backfill Material or

206.02.05A Crushed Aggregate

Paragraphs under subsections are alphabetical with subparagraphs numbered (1), (2), etc.

101.01 DEFINITIONS

Attorney The City Attorney of the City of Gresham, Oregon.

Bid Item A specific unit of work for which a price or basis of payment is provided in the Contract.

Bidder An entity that submits an Offer in response to a Notice to Contractors.

Certificate of Compliance and Final Completion Standard City form including one part that must be signed by the Contractor stating compliance with the Contract and an additional section that must be signed by the Inspector, Project Manager, Engineer and Manager when the Work has been 100% completed in accordance with all requirements.

Certificate of Substantial Completion Standard City form that is signed by the Project Manager when the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Project Manager, it is sufficiently complete in accordance with the Contract, so that the Work (or specified part) can be utilized for the purposes for which it is intended.

Change Order A written order issued by the Project Manager to the Contractor directing changes in the Work, subject to approval of the Manager.

City	The City of Gresham, a municipal corporation of the State of Oregon, and its elected officials, officers, employees, volunteers and agents.
Contract	The written agreement, resulting from the Notice to Contractors and Offer that sets forth the rights and obligations of the City and the Contractor.
Contract Documents	For publicly financed public improvement projects, the Contract Documents include, but are not limited to, the ***Public Works Standards***, the solicitation documents, plans, and bid book provided to Bidders and includes all documents included or referenced therein, the Contract, any addendums issued before Offers are opened, and any amendments or Change Orders after the Contract is signed. For privately financed public improvements projects, the Contract Documents include, but are not limited to, the ***Public Works Standards***, the applicable permit(s) including any conditions of approval, and the approved Plans for the Work.
Contract Price	The total price to be paid for the Work satisfactorily completed in accordance with the Contract Documents, including any approved alternates and any fully executed Change Orders or amendments.
Contractor	For publicly financed public improvement projects, “contractor” will mean the entity awarded the Contract. For privately financed public improvement projects, “contractor” will mean the development permit holder; provided that use of the term contractor for privately financing public improvements shall not be deemed to mean that the development permit holder is a contractor in the sense of selling a good, service, personal service or public improvement to the City.
Days	Calendar days, including weekends and holidays, unless otherwise specified in the Contract Documents.
Engineer	The applicable City of Gresham Department of Environmental Services division manager, or designee, who is licensed as a registered professional engineer in the State of Oregon.
Engineer of Record	A registered professional engineer licensed to practice in the State of Oregon who is responsible for the design of a public improvement and who has stamped the Plans.
Improvement	General term encompassing all phases of the Work to be performed under the Contract Documents and synonymous with the term Project.
Inspector	The authorized representative of the City whose authority, instructions, and decisions shall be limited to the particular duties and responsibilities entrusted to them in making detailed inspections of any or all portions of the Work or materials thereof.
Lump Sum	A method of payment providing for one all-inclusive payment for the Work described to be done, complete and accepted without further measurement, as such Work is covered under the applicable Lump Sum pay item.
Manager	The City Manager of the City of Gresham acting either directly or through authorized representatives.
Notice	A written communication delivered by hand or by mail (including electronically) to the authorized individual, member of the firm, or officer of the corporation for which it is intended. If delivered or sent by mail it shall be addressed to the last known business address of the individual, firm, or corporation. In the case of a Contract with two (2) or more persons, firms, or corporations, notice to one shall be deemed notice to all.

Notice to Contractors	The public announcement inviting Offers for Work to be performed or materials to be furnished.
Offer	A written offer to conduct the Work, binding on Bidder and submitted in response to a Notice to Contractors.
Oregon Standard Specifications for Construction	The edition of the specification document published by the Oregon Department of Transportation and the American Public Works Association entitled *Standard Specifications for Construction* in effect on the date the Notice to Contractors is published. This document is available from the Oregon Department of Transportation, Salem, Oregon.
Plans	The Standard Details, or reproductions thereof, and project specific plans, profiles, cross sections, elevations, details, and other working or supplementary drawings signed by the Engineer of Record that show the location, character, dimensions, and details of the Work to be performed. Plans for privately financed public improvement projects must be approved by the Project Manager. Plans for publicly financed public improvement projects may either be bound in the same book as the balance of the Contract Documents or bound in separate sets and are a part of the Contract Documents regardless of the method of binding.
Project	General term encompassing all phases of the Work to be performed under the Contract Documents and synonymous with the term Improvement.
Project Manager	The City's representative charged with the management of the Project. For publicly financed public improvement projects, the Project Manager is typically the Engineer or the Engineer's representative. For privately financed public improvement projects, the Project Manager is typically a Development Engineering Specialist of the City.
Provide	When related to an item of work, the word "provide" shall be understood to mean furnish and install the Work complete in place.
Public Works Standards	The ***Public Works Standards*** adopted by the City of Gresham and containing Design Standards, Standard Specifications, and Standard Details.
Right-of-way	A general term denoting public land, property, or interest therein, acquired for or devoted to a public street or accessway. It includes, but is not limited to, streets, roads, highways, bridges, alleys, sidewalks and all other public ways, including the subsurface under and air space over these areas under the jurisdiction of the City or other public entity.
Roadway	That portion of a street and its appurtenances, typically between curbs or ditches, primarily used for vehicular traffic.
Schedule of Prices	The list of Bid Items, including the unit of measurement and Unit Price, included in the Contract Documents.
Shop Drawing	Supplementary plan(s) or data or other information that the Contract Documents require the Contractor to submit to the Project Manager.
Shown	As used herein, the word "shown," or "as shown," shall be understood to refer to work shown on the Plans in the Contract Documents.
Special Provisions	Project specific requirements that make changes, modifications, or clarifications to the Standard Specifications.

Specifications	The Standard Specifications, Special Provisions and Unique Specifications referred to or set forth in the Contract Documents.
Specified	As used herein, the word “specified,” or “as specified,” means as required by the Contract Documents.
Standard Details	Detailed representations of structures, devices, or instructions set forth in the ***Public Works Standards***.
Standard Specifications	The terms, directions, provisions and requirements set forth in Chapters 100 through 600 of the ***Public Works Standards***.
Station	A distance measured horizontally along the established centerline of a street, sewer, or other work, unless specified otherwise.
Subcontractor	An individual, partnership, firm, corporation, or any combination thereof, which the Contractor has selected to perform part of the Work.
Submittal	Supplementary Plans or data or other information that the Contract Documents require the Contractor to submit to the Project Manager.
Surety	The corporate body that is bound with and for the Contractor for the acceptable performance of the Project and for the payment of all obligations arising out of the Contract Documents.
Surveyor	A registered professional land surveyor licensed to practice in the State of Oregon.
Temporary Pedestrian Accessible Route	An area within a work zone, marked by signing, delineation, PCD, and TCD, for the use of pedestrians to navigate through or around the work area. The TPAR is included as part of the traffic control plan.
Temporary Pedestrian Accessible Route Plan	A written and drawn plan within the traffic control plan that identifies requirements for providing safe, effective and accessible routes for pedestrians through or around the work zone including TPAR details, advance public notification, and construction and maintenance responsibilities.
Traffic Control Device	Signs, signals, markings, and other devices placed on, over, or adjacent to a roadway used to regulate, warn, or guide public traffic by authority of a public body or official having jurisdiction.
Traffic Control Measure	Elements of the traffic control plan including, but not limited to, TCD, personnel, materials and equipment used to control public traffic through a work zone.
Unique Specifications	Project specific technical requirements included in the Contract Documents that supplement Chapters 200 through 600 of the ***Public Works Standards***.
Unit Price	A Bid Item of work providing for payment based on a specific unit of measurement; e.g., lineal foot or cubic yard.
Use of Pronoun	As used herein, the singular shall include the plural, and the plural the singular; any masculine pronoun shall include the feminine or neuter gender; and the term "person" includes natural person or persons, firm, co-partnership, corporation or association, or combination thereof.
Utility	Tracks, overhead or underground wires, pipelines, conduits, ducts, or structures, owned, operated, or maintained in or across a public Right-of-way or easement.

Work The furnishing of all materials, equipment, labor, and incidentals necessary to successfully complete any individual item or, if the context requires, the entire Project including the successful completion of all duties and obligations imposed by the Contract Documents.

Work Zone In terms of street construction, the work zone is an area which extends from the first road work, bridge work, or utility work warning sign to the last sign or the last traffic control device.

Working Day Calendar day, any and every day shown on the calendar, excluding Saturdays, Sundays, and legal holidays.

101.02 ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BCD	Bicycle Channelizing Device
DEQ	Department of Environmental Quality
EPA	Environmental Protection Agency
GCDC	Gresham Community Development Code
GRC	Gresham Revised Code
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
ODOT	Oregon Department of Transportation
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
PCD	Pedestrian Channelizing Devices
TCD	Traffic Control Devices
TCM	Traffic Control Measures
TPAR	Temporary Pedestrian Accessible Route
UL	Underwriters' Laboratories, Inc.

101.03 APPLICABILITY OF PUBLIC WORKS STANDARDS TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS

A. The ***Public Works Standards*** are applicable to all public improvements constructed within the City of Gresham, including public improvements built in conjunction with private development.

B. The ***Public Works Standards*** contains provisions relating to solicitations, offers and contracts awarded by the City for publicly financed public improvement projects. These provisions are not applicable to privately financed public improvement projects. The remaining provisions of the ***Public Works Standards*** are applicable to privately financed public improvement projects.

C. If a section, subsection, or portion thereof, of the ***Public Works Standards*** is not applicable to privately financed public improvements, it is so noted in the title or text of the section or subsection. If not noted in the title or text as "Not applicable to privately financed

public improvements", the section or subsection is applicable to privately financed public improvements except as specifically stated in the subsection.

102 INSTRUCTIONS TO BIDDERS

(Not applicable to privately financed public improvements)

The provisions of *Oregon Revised Statutes Chapter 279A and 279C* and *Oregon Administrative Rules Chapter 137, Divisions 46 and 49*, apply to all publicly financed public improvement projects that incorporate the ***Public Works Standards*** of the City of Gresham into the Contract. In case of conflict, the order of precedence in controlling the work shall be: *Oregon Revised Statutes Chapter 279A and 279C*, the ***Public Works Standards***, and the *Oregon Administrative Rules Chapter 137, Divisions 46 and 49*.

102.01 SOLICITATION PROTEST *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A person may protest or request a change of a solicitation provision, evaluation criteria, plan, specification, or contract term no later than ten calendar days prior to the offer due date. No protest of the selection of a contractor or the award of a contract because of a solicitation provision, evaluation criteria, plan, specification, or contract term will be considered after such time. The protest or request for change shall include the reason for such and any proposed change. The Manager shall consider the protest or request for change and may reject the protest or request for change, issue an addendum, or cancel the Notice to Contractors. The protest must be submitted to the Project Manager. Failure to submit a protest prior to the deadline constitutes a waiver of any and all objections to or protests of the solicitation documents.

102.02 BID PROVISIONS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. This contract is for a public works project subject to the state prevailing rates of wage under *ORS 279C.800 to 279C.870*. No offer will be received or considered by the City unless the offer contains a statement by the Bidder as a part of its offer that Bidder will comply with the provisions of Oregon's Prevailing Wage Laws and the applicable Oregon Administrative Rules including *ORS 279C.840*. The applicable wages in effect on the first date the Notice to Contractors was published can be found in *Prevailing Wage Rates for Public Works Contracts in Oregon* published by the Bureau of Labor and Industries (BOLI) at https://www.oregon.gov/boli/WHD/PWR/Pages/pwr_state.aspx.

B. Each Bidder must identify in the Offer and Schedule of Prices whether the Bidder is a "resident bidder" as defined in *ORS 279A.120*.

C. The Bidder need not be licensed under *ORS 468A.720* relating to asbestos abatement unless required in the Special Provisions.

D. No offer for a public improvement contract shall be received or considered by the City unless the Bidder is licensed with the Construction Contractors Board. If the work is required by law to be performed by a landscape contractor, the Bidder must be licensed with the State Landscape Contractors Board.

E. First-Tier Subcontractors Disclosure. Bidders are required to disclose information about certain first-tier subcontractors when the contract value estimated by the City for the Work is greater than $100,000.

   Specifically, when the contract amount of a first-tier subcontractor furnishing labor or labor and materials would be greater than or equal to (i) 5% of the project bid, but a least

$15,000, or (ii) $350,000 regardless of the percentage, the Bidder must disclose the following information about that subcontract in its bid submission or within two working hours after bid closing:

(1) The subcontractor's name,

(2) The dollar value, and

(3) The category of work that the subcontractor would be performing.

If the Bidder will not be using any subcontractors that are subject to the above disclosure requirements, the Bidder is required to indicate "NONE" on the accompanying form.

THE CITY OF GRESHAM MUST REJECT A BID IF THE BIDDER FAILS TO SUBMIT THE DISCLOSURE FORM WITH THIS INFORMATION BY THE STATED DEADLINE.

F. Persons obtaining contract documents from sources other than the City must register in writing with the Project Manager to be assured of receiving addenda.

102.03 QUALIFICATION OF BIDDERS AND CONTRACTORS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Bidders need not be prequalified unless required by a Special Provision. All prequalification requirements shall be included in the Special Provisions.

B. Bidder's responsibility pursuant to *ORS 279C.375* will be evaluated after bid opening when the Manager determines the lowest responsible Bidder.

C. If required by the City, a Contractor's Qualification Application must be submitted prior to award of the Contract. Qualification application forms may be obtained from the Project Manager.

102.04 FORM OF BID *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Bidders shall enclose the offer, any documents required to be submitted with the offer, and bid security in a sealed, labeled, and addressed envelope and submit the envelope as required in the Notice to Contractors. The outside of the envelope should plainly identify the Project name and the offer opening date and time. Facsimile and electronic data interchange offers shall not be accepted unless otherwise specified in the Special Provisions.

B. All offers must be clearly and distinctly typed or written with ink or indelible pencil and be on the form furnished by the City and, in addition to necessary unit price items and total prices in the column of totals to make a complete bid, all applicable blanks giving general information must be filled in and the offer signed by the Bidder or a duly authorized agent. Any statement accompanying and tending to qualify an offer may cause rejection of such bid, unless such statement is required in an offer embracing alternative bids.

C. Unless otherwise specified, Bidders shall offer on all items included in the Contract Documents, and the lowest responsible Bidder shall be determined as noted in **Subsection 104.01**. Except as provided herein, offers that are incomplete or fail to reply to all items required in the Contract Documents may be rejected.

D. The bid must state whether business is being done as an individual, a co partnership, a corporation, or a combination thereof, and if incorporated, in what state, and if a co partnership, state names of all partners. The person signing on behalf of a corporation, a co partnership, or combination thereof shall state their position with the firm or corporation,

and by submitting the bid, expressly represent that the signer is duly authorized to bind Bidder, and shall state whether the Bidder is licensed to do business in the State of Oregon.

E. Bidder, in submitting the bid, certifies that Bidder is not ineligible to receive a contract for a public work pursuant to *ORS 279C.860* and that every subcontractor will not be ineligible to receive a contract for a public work pursuant to *ORS 279C.860*.

F. Bidder, in submitting the bid, certifies that Bidder is not on the list created by the Construction Contractors Board under *ORS 701.227* as not qualified to hold a public improvement contract

G. Bidder, in submitting the bid, certifies that the Bidder has not and will not discriminate against minorities, women, emerging small business enterprises or a business enterprise that is owned or controlled by or that employs a disabled veteran, in the awarding of subcontracts.

H. Bidder, in submitting the bid, certifies that the Bidder has access to and has reviewed the current edition of the ***Public Works Standards***.

102.05 WITHDRAWAL, MODIFICATION, OR ALTERATION OF BID *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. An offer may only be withdrawn on written or electronic request of the Bidder and received by the Project Manager prior to the scheduled closing time for submitting offers.

B. Prior to offer opening, changes may be made provided the Bidder or the Bidder's agent initials the change. If the intent of the Bidder is not clearly identifiable, the interpretation most advantageous to the City will prevail.

C. Once opened, all bids are irrevocable for 60 days. No Bidder may withdraw an offer after offer opening unless 60-days have elapsed, and the Manager has not awarded a contract.

102.06 LATE OFFERS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Offers not actually received at the specified location or received after the scheduled closing time for submission of offers, both as set forth in the Notice to Contractors, will be rejected and returned unopened to the Bidder.

102.07 BID SECURITY *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

All offers must be accompanied by a Bid Security guaranteeing that the offer will be irrevocable for 60-days, unless specified otherwise, in the form of a certified check or cashier's check payable to the order of the City of Gresham, or a surety bond in such form as is approved by the Attorney in an amount of at least ten percent (10%) of the amount of the bid. Such bid security shall be forfeited if the Bidder shall fail or neglect to furnish the performance and payment bonds, certificate of insurance, and to execute and return the Contract within fifteen (15) days after issuance of the Contract. Bid Security shall be returned as provided in **Subsection 104.08**.

102.08 ADDENDA *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Written Addenda will be issued if, in the opinion of the Project Manager, a change to or additional information or interpretation of the Contract Documents is required. Addenda to the Contract Documents shall be mailed or, with explicit consent, sent electronically to the address provided by potential Bidders that have obtained a copy of the Contract Documents from the Department of Environmental Services. Addenda shall also be mailed or, with explicit consent, sent electronically to the address provided by potential Bidders

who have registered in writing with the Project Manager listed in the Notice to Contractors of their interest in a particular project.

B. Any addendum issued by the Manager that may include changes, corrections, additions, interpretations, or information and issued seventy-two (72) hours or more before the scheduled closing time for submission of offers (Saturday, Sunday, and legal holidays not included) shall be binding upon the Bidder. The Manager may issue Addenda on less than 72 hours' notice provided the addenda extends the bid closing.

C. Oral instructions or information given out by officers, employees, or agents of the City shall not bind the City.

102.09 EXAMINATION OF THE CONTRACT DOCUMENTS, SITE OF WORK, AND SUBSURFACE DATA *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Bidders are advised to review **Subsection 103.24** regarding this matter.

102.10 FAMILIARITY WITH LAWS AND ORDINANCES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Bidders are advised to review **Subsection 103.25** regarding this matter.

102.11 UNIT PRICES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The estimate of quantities of work to be done under unit prices is approximate and is given only as a basis of calculation for comparison of offers and award of the Contract. The Manager does not warrant that the actual amount of work will correspond to the amount as shown or estimated. Payment at unit prices will only be made for work actually performed or materials actually furnished according to actual measurements that were necessary to complete the work.

B. Bidders must include in their unit prices the entire cost of each item of work set forth in the offer, and when, in the opinion of the Manager, the prices in any offer are obviously unbalanced, such offer may be rejected.

C. The unit prices for the various Contract Items shall be full compensation for all labor, materials, supplies, equipment, tools, and all things of whatsoever nature are required for the complete incorporation of the item into the work the same as though the item were to read "In Place."

102.12 REJECTION OF OFFERS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

The Manager may reject any offer not in compliance with all prescribed public bidding procedures and requirements including the requirement to demonstrate the bidder's responsibility under *ORS 279C.375 (3)(b)*. The Manager may, for good cause, reject any or all offers upon a finding doing so is in the public interest. In any case where competitive offers are required and all offers are rejected, and the project is not abandoned, new offers may be called for as in the first instance. The Project Manager may waive minor informalities at its own discretion.

102.13 CONFLICT OF INTEREST *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A Bidder submitting an offer thereby certifies that no officer, agent, or employee of the City who has a pecuniary interest in the offer has participated in the Contract negotiations on the part of the City, that the offer is made in good faith without fraud, collusion, or connection of any kind with any other Bidder, and

that the Bidder is competing solely on its own behalf without connection with, or obligation to, any undisclosed person or firm.

103 LEGAL RELATIONS AND RESPONSIBILITIES

103.01 APPLICABLE LAWS AND VENUE

The provisions of the Contract Documents shall be construed in accordance with the laws of the State of Oregon and ordinances of the City. Any action or suits involving any question arising under the Contract Documents must be brought in the appropriate court in Multnomah County, Oregon. If the claim must be brought in a federal forum, then it shall be brought and conducted in the United States District Court for the District of Oregon. In construing the Contract Documents, no presumption or burden of proof against the drafter or in favor of any party by virtue of authorship shall be given.

103.02 EQUAL EMPLOYMENT OPPORTUNITY/AFFIRMATIVE ACTION

The Contractor must comply with the City of Gresham's Equal Opportunity Policy for Contractors. The Contractor shall not discriminate against minorities, women, emerging small business enterprises or a business enterprise that is owned or controlled by or that employs a disabled veteran, in the awarding of subcontracts.

103.03 SUBCONTRACTORS

A. Use of subcontractors, material suppliers, or equipment suppliers shall in no way release the Contractor from any obligations to the City.

B. The Contractor will provide in all subcontract agreements that the subcontractor, material supplier, and equipment supplier will be bound by the terms and conditions of the Contract Documents to the extent that they relate to the subcontractor's work, material, or equipment. For publicly financed public improvement projects, each subcontract shall expressly provide that the subcontract is assignable to the City at the City's option, in the event the Contract is terminated for default of the Contractor.

C. For publicly financed public improvement projects, Contractor will require each subcontractor providing labor for the project to:

(1) Demonstrate to the Contractor that it has a Qualifying Employee Drug-testing Program (See **Subsection 104.03B**) for the subcontractor's Subject Employees. Subcontractors shall represent and warrant to the Contractor that the Qualifying Employee Drug-testing Program is in place at the time of subcontract execution and will continue in full force and effect for the duration of the subcontract; or

(2) Require that the subcontractor's Subject Employees participate in the Contractor's Qualifying Employee Drug-testing Program for the duration of the subcontract.

103.04 NO WAIVER OF LEGAL RIGHTS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The City shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after completion and acceptance of work or payment therefore, from showing the true amount and character of work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or that work or materials do not conform to the Contract Documents. The City shall not be precluded or estopped, notwithstanding any such measurement,

estimate, or certificate, or payment in accordance therewith, from recovering from the Contractor and the surety such damages as it may sustain by reason of failure to comply with terms of the Contract Documents, or from enforcing compliance with the Contract Documents.

B. Neither acceptance by the City, or by any representative or agent of the City, of the whole or any part of the work, nor any extension of time, nor any possession taken by the City, nor any payment for all or any part of the project, shall operate as a waiver of any portion of the Contract Documents or of any power herein reserved, or any right to damages herein provided. Any failure to enforce any provision or any waiver of any breach of the Contract shall not be held to be a waiver of any other provision or breach.

103.05 OTHER CONTRACTS

A. The City reserves the right to award other contracts or issue permits for work that may require coordination with the work to be performed under the Contract Documents.

B. When other contracts or permits are awarded or issued by the City for different portions of the work, "the contractor" in each case shall be the person who signs the other contract or is the holder of the permit.

C. Mutual Responsibility of Contractors – The Contractor shall afford other contractors' reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate said work with theirs.

D. If any part of the Contractor's work depends, for proper execution or results, upon the work of any other contractor, the Contractor shall inspect and promptly report to the Project Manager any apparent discrepancies or defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to inspect and report shall constitute an acceptance of the other contractor's work by the Contractor as fit proper to receive the work, except as to defects that may develop in the other contractor's work after the execution of the Contractor's work.

E. Should the Contractor cause damage to the work or property of any other contractor which results in a claim against the City, and if the claim is not satisfied by the Contractor and the other contractor sues the City or initiates an alternative dispute resolution proceeding on account of any damage alleged to have been so sustained, the City shall notify the Contractor who shall defend if requested such proceedings at the Contractor's expense, and if there is any judgment or award against the City, the Contractor shall pay or satisfy it and shall reimburse the City for all attorney's fees, and court, alternative dispute resolution, or appeal costs which the City has incurred.

F. The Contractor shall be responsible for any cutting, fitting, and patching that may be required to complete the work except as otherwise specifically provided in the Contract Documents. The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other contractor. Any costs caused by defective or ill-timed work shall be borne by the party responsible therefore.

G. If a dispute arises as to the responsibility for cleaning up or finishing work, the City may clean up and charge the cost thereof to the Contractor and other contractors as the Project Manager shall determine to be just.

103.06 LIABILITY AND INDEMNIFICATION

The Contractor shall assume all responsibility for the work and shall bear all losses and damages directly or indirectly resulting to the Contractor or to the City, on account of (a) the character or performance of the work, (b) unforeseen difficulties, (c) accidents, or (d) any other cause whatsoever.

Contractor shall defend, save, hold harmless, and indemnify the City, the Engineer of Record, and their officers, agents, and employees from all claims, suit, or actions of whatsoever nature resulting from arising out of the activities of the Contractor or its officers, employees, subcontractors, or agents under the Contract Documents. The Contractor shall assume this responsibility even if (a) fault is the basis of the claim, or (b) any act, omission or conduct of the City is a condition or contributory cause of the claim, loss, damage or injury. The Contractor waives any and all statutory or common law rights of defense and indemnification by the City.

The Contractor shall not be liable for, nor be required to defend or indemnify the City or the Engineer of Record relative to any claim, loss, damage, or injury resulting solely from negligent acts or omissions by the City, the Engineer of Record, or their officers, agents or employees.

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

103.07 INSURANCE *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. General

(1) The Contractor shall provide and maintain during the life of the Contract the insurance coverage described below. All costs for such insurance shall be borne by the Contractor at no expense to the City. The Contractor shall comply with all conditions and obligations of insurance policies.

(2) In case of the breach of any provision of this subsection, the City may elect to take out and maintain, at the expense of the Contractor, such insurance as the City may deem proper. The City may deduct the cost of such insurance from any monies that may be due or become due the Contractor under the Contract. Failure to maintain insurance as provided is also cause for immediate termination of the Contract.

B. Review and Approval of Insurance

Contractor shall furnish the Project Manager certificates of insurance, which must be acceptable to the Attorney prior to execution of the Contract by the City and before the Contractor or any subcontractor commences work under the Contract. The certificate shall show the name of the insurance carrier, coverage, type, amount (or limits), policy numbers, effective and expiration dates, and a description of operations covered. The certificate will include the deductible or retention level and required endorsements. Insuring companies or entities are subject to the Attorney's acceptance. If requested, copies of insurance policies shall be provided to the Attorney. The Contractor shall be responsible for all deductibles, self-insured retention's, and/or self-insurance. Approval of the insurance shall not relieve or decrease the liability of the Contractor hereunder.

C. Workers' Compensation

(1) The Contractor shall provide and shall require all subcontractors to provide workers' compensation insurance in compliance with *ORS 656.017*. All employers, including the Contractor, that employ subject workers who work under the Contract

in the State of Oregon shall comply with *ORS 656.017* and provide the required Workers' Compensation coverage, unless such employers are exempt under *ORS 656.126*. The Contractor shall ensure that each of its subcontractors complies with these requirements.

In addition to the statutory benefits outlined above, the Contractor and all subcontractors shall provide employers' liability insurance with limits of not less than:

$500,000 each accident for bodily injury by accident

$500,000 each employee for bodily injury for disease

$500,000 policy limit for bodily injury by disease

(2) The Contractor shall defend, indemnify, and hold harmless, the City and the City's officers, agents, and employees against any liability that may be imposed upon them by reason of the Contractor's or subcontractor's failure to provide workers' compensation and employers liability coverage.

(3) Where work under the Contract is subject to the Federal Longshoremen and Harborworkers' Act or the Federal Jones Act, the Contractor shall provide such coverage.

D. General Liability and Automobile Liability for Publicly Financed Public Improvement Projects

(1) The Contractor shall provide a commercial general liability policy that provides coverage for bodily injury, personal injury and property damage and commercial automobile liability insurance. Such insurance must protect the Contractor, the City, and their officers and employees from all claims or damage which may arise out of the Contract or in connection therewith, including all operations of Subcontractors.

Such insurance shall provide coverage for not less than the following limits of liability:

$2,000,000 each occurrence

$3,000,000 general aggregate

$1,000,000 product and completed operations aggregate

$50,000 fire damage (any one fire)

$500,000 employers liability

$1,000,000 combined single limit automobile liability for owned, non-owned, and hired automobiles.

(2) The insurance shall be written on a form that includes coverage for broad form contractual liability; broad form property damage; personal and advertising injury; the owners and contractor protective; premises/operations; and products/completed operations. Coverage shall not exclude excavation, collapse, underground, or explosion hazards. Such insurance shall be maintained until the expiration of the warranty period required by the Contract.

(3) If there are insufficient insurance proceeds and assets of the Contractor to fully indemnify the City, and the Engineer of Record if not an employee of the City, then the City will be indemnified first with any remaining insurance proceeds and assets to be used to indemnify the Engineer of Record if not an employee of the City.

(4) If set forth in a Special Provision, additional insured's may be the City's consultant, the Engineer of Record (if not an employee of the City), other governmental bodies with jurisdiction in the area involved in the project, and their officers and employees and such agents as may be specified.

E. Claims on Project

The Contractor, when notified of a claim by an affected party, shall:

(1) Refer claim to the Contractor's insurance carrier or claims administrator with a copy to the Project Manager.

(2) The Contractor or Contractor's insurer will copy the Project Manager on acknowledgment of claim.

(3) The Contractor or Contractor's insurer will copy the Project Manager on notice to claimant of disposition of claim.

F. Notice of Cancellation or Change

Unless waived by the City, Contractor shall not cancel, fail to renew, or modify any required insurance coverage without first providing the Project Manager with a minimum of 30 days written notice. If Contractor cancels, fails to renew, or modifies coverage, the City will only approve replacement insurance if the replacement insurance complies with the requirements for coverage in this Section. Contractor shall, immediately upon notice from its insurer, notify the Project Manager of insurer's intent to modify, cancel, or not renew existing policy. In the event of any anticipated lapse in coverage, Contractor shall immediately obtain replacement insurance, and submit to City for approval as provided above. City reserves the right to stop work if a lapse in coverage occurs.

G. Additional Insured

For general liability insurance and automobile liability insurance, the City, its agents, officers, and employees will be Additional Insured's by endorsement, but only with respect to the Contractor's services to be provided under the Contract. This coverage shall be by endorsement physically attached to the certificate of insurance.

103.08 ROYALTIES AND PATENTS

Contractor shall pay all royalties and license fees required to perform the work. Contractor shall defend and indemnify the City from all loss or damage that may result from the Contractor's wrongful or unauthorized use of any patented article or process.

103.09 PERMITS

Unless otherwise provided in the Special Provisions, and except for the Permits attached to the Contract Documents, Contractor shall secure all Municipal, County, State, Federal or other permits or licenses necessary or incidental to performance of the work under the Contract Documents. Contractor shall comply with all permit requirements pertaining to the construction of the project.

In all cases, the applicant shall be required to replace or restore the right-of-way and any adjacent areas impacted by the applicant to an equal or better condition than existed prior to permit issuance.

Applicant or his contractor shall advise the City at least 48-hours in advance of commencing construction of the facility authorized by the permit. The City may require adjustment of the construction schedule to allow for inspection by the City.

103.10 SANITARY FACILITIES AT CONSTRUCTION PROJECTS

Contractors shall comply with 29 CFR 1926.51 as adopted by OR-OSHS by reference in *OAR 437-003-0001(4)(b)*. In addition, and as required by *ORS 654.150*, if the Contract price is estimated (unit prices) or offered (lump sum) by the Contractor at $1,000,000 or more, the Contractor shall be responsible for all costs (which costs shall be included in the offer whether or not a specific item is provided therefore) that may be incurred in complying with or securing exemption or partial exemption from the requirements of *ORS 654.150* (Sanitary facilities at construction projects; standards, exemptions) and the rules adopted pursuant thereto. Determination of applicability of *ORS 654.150* to the project is the sole responsibility of the Contractor.

The aforementioned requirements notwithstanding, the Contractor shall provide 1 toilet facility for 20 or less employees or, if the Contractor has between 20 and 199 employees, 1 toilet facility per 40 employees shall be provided in accordance with OR-OSHA requirements.

103.11 COMPLIANCE WITH OREGON REVISED STATUTES CHAPTERS 279A AND 279C *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Compliance with Applicable Law

Contractor shall comply with all federal, state, and local laws, regulations, executive orders and ordinances applicable to the work under the Contract, including without limitation, *ORS 279A.120, ORS 279C.505, ORS 279C.510, ORS 279C.515, ORS 279C.520, ORS 279C.530, ORS 279C.570, and ORS 279C.580* which can be found at https://greshamoregon.gov/WorkArea/DownloadAsset.aspx?id=8214. In addition, the provisions of *ORS 279C.525* (Provisions concerning environmental and natural resources laws); *ORS 279C.540* (Maximum hours of labor on public contracts); *ORS 279C.545* (Claims for overtime); *ORS 279C.550 to ORS 279C.565* (Retainage); *ORS 279C.585* (Authority to substitute undisclosed first-tier subcontractor); *ORS 279C.590* (Complaint process for substitutions of subcontractors); *ORS 279C.600* to *ORS 279C.625* (Bonds); *ORS 279C.650 to ORS 279C.670*; (Termination for Public Interest) and *ORS 279C.800 to ORS 279C.870* (Prevailing Wages) are all incorporated into the Contract by this reference as though set forth in full.

Without limiting the foregoing, Contractor expressly agrees to comply with: (i) Titles VI and VII of the Civil Rights Act of 1964, as amended; (ii) Sections 503 and 504 of the Rehabilitation Act of 1973, as amended; (iii) the Americans with Disabilities Act of 1990, as amended; (iv) Executive Order 11246, as amended; (v) the Health Insurance Portability and Accountability Act of 1996; (vi) the Age Discrimination in Employment Act of 1967, as amended, and the Age Discrimination Act of 1975, as amended; (vii) the Vietnam Era Veterans' Readjustment Assistance Act of 1974, as amended; (viii) *ORS Chapter 659*, as amended; (ix) all regulations and administrative rules established pursuant to the foregoing laws; and (x) all other applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations. A condition or clause required by law to be in the Contract shall be considered included by these references.

103.12 LABOR

A. Contractor must comply with the City of Gresham's Equal Opportunity Policy for Contractors. The Contractor shall not discriminate against minorities, women, or emerging small business enterprises in the awarding of subcontracts.

B. Upon notification in writing from the Manager, remove immediately from the job for its duration any laborer, workman, mechanic, foreman, superintendent, or other person employed who is found to be incompetent, intemperate, troublesome, disorderly or otherwise objectionable, or who fails or refuses to perform their work properly or acceptably.

C. Comply with *ORS Chapter 659* relating to unlawful employment practices and discrimination by employers against any employee or applicant for employment because of race, religion, color, sex, sexual orientation, national origin, marital status or age. Particular reference is made to *ORS 659.030*, which states that it is unlawful employment practice for any employer, because of the race, religion, color, sex, or national origin of any individual, to refuse to hire or employ or to bar or discharge from employment such individual or to discriminate against such individual in compensation or in terms, conditions or privileges of employment.

103.13 PREVAILING WAGES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

The Contractor shall comply, and shall require subcontractors to comply, with *ORS 279C.800* to 279C.870, Oregon's Prevailing Wage Law. For public works for which the Contract Price is $50,000 or more, all workers employed in the performance of the contract either by the contractor, subcontractor, or other person doing or contracting to do the whole or any part of the work contemplated by the contract shall be paid not less than such specified minimum hourly rate of wage in accordance with *ORS 279C.840*. The Contractor and every tier of subcontractor shall file with the Project Manager the certified statement as required by *ORS 279C.845*. The Contractor shall verify that first-tier subcontractors have filed certified statements with the City. If a Contractor is required to file certified statements under *ORS 279C.845*, the City shall retain from the Contractor 25 percent of any amount earned until the certified statement is filed.

103.14 OVERTIME FOR CITY PERSONNEL

A. The Contractor shall notify the Project Manager of any overtime operations as soon as possible but no less than 48-hours before the work is to occur, except in cases of emergency. The Contractor must provide documentation to the Project Manager's satisfaction detailing when and for how long the overtime work will occur.

B. For publicly financed public improvement projects, in the event that the Contractor wishes to proceed with an overtime operation, the Contractor must first notify and obtain approval from the Project Manager to do so, prior to commencing such work which approval will not unreasonably be withheld provided the City, in its discretion, has inspectors and other personnel available and the overtime will not unduly have an adverse impact on the public.

C. For overtime work the Contractor shall pay the applicable wage rate, including fringe benefits, for the City's personnel, and other staff required at the project during the overtime hours at 1.5 times the regular rate of pay for all overtime worked, except for holidays where the rate will be 2.5 times the regular rate of pay.

D. This subsection does not apply to labor performed in the manufacture or fabrication of any material ordered by the Contractor or manufactured or fabricated in any plant or place other than the place where the main work is to be performed.

E. Overtime is defined as hours outside of the hours of an employee's regularly scheduled 40-hour workweek. Work performed on weekends and City-recognized holidays would also constitute overtime.

103.15 SAFETY

A. Employee Safety:

The Contractor shall at all times be responsible for the safety of their employees and their subcontractor's employees. The Contractor shall maintain the job site and perform the work in a manner which meets the Contractor's (and the City's, if any) responsibility under statutory and common law for the provision of a safe place to work and which complies with all applicable safety regulations.

B. Public Safety and Convenience:

The Contractor shall at all times conduct their work so as to ensure the least possible obstruction to traffic and convenience to the general public and residents in the vicinity of the work and to ensure the protection of persons and property.

C. Specific City Public Safety Requirements

Conduct the project with proper regard for the safety and convenience of the public. The Contractor shall follow the following safety related requirements:

(1) No road or street shall be closed to the public except with the permission of the Transportation Engineer and proper governmental authority. When the project involves use of public ways, that are to be closed to the public, provide necessary flag persons and proper signage.

(2) Fire hydrants on or adjacent to the work shall be kept accessible to firefighting equipment at all times.

(3) Install and maintain means of reasonable access to all service stations, warehouses, stores, houses, garages, and other property.

(4) Temporary provisions shall be made by the Contractor to ensure the use and proper functioning of sidewalks, private and public driveways, all gutters, sewer inlets, drainage ditches and culverts, irrigation ditches, and natural watercourses.

(5) Private residential driveways shall be closed only with approval of the Engineer or specific permission of the property owner.

(6) The Contractor will minimize inconvenience to others due to mud and dust.

(7) Do not interfere with normal operation of public transit vehicles unless otherwise authorized.

(8) Do not obstruct or interfere with travel over any public street or sidewalk without approval.

(9) At all times provide open trenches and excavations with secured and adequate barricades or fences of a type approved by the Manager that can be seen from a reasonable distance.

(10) Close up or plate all open excavations at the end of each working day in all street areas unless approved otherwise by the Manager and in all other areas when it is reasonably required for public safety or as directed by the Manager.

(11) At night, mark all open work and obstructions by lights.

(12) Install and maintain all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges, and facilities necessary to ensure safety and convenience of the public.

D. Safety Program:

The Contractor shall adopt a written safety program complying with the requirements of employee and public safety set forth hereinabove and any applicable Special Provisions. The safety program shall also comply with *OAR Chapter 437, Division 3 and 29* CFR Part 1926 regarding general safety and health provisions.

E. Observe all safety instructions received from the Manager, manufacturer, or governmental authorities but following of such instructions shall not relieve the Contractor from its responsibility or liability for accidents to workers or damage or injury to person or property. The City, the Project Manager, the Engineer, and the Inspector shall have no obligation or duty to monitor or enforce the Contractor's safety responsibility. Failure of Contractor to comply with safety measures required under the contract or by law constitutes a breach of contract.

103.16 Two (2) Year Warranty

A. In addition to and not in lieu of any other warranties required elsewhere in the Contract Documents, make all necessary repairs and replacements to remedy, in a manner satisfactory to the Project Manager and at no cost to the City, the failure, as determined by the City, to conform with Contract Documents including installation of any sidewalk conditioned to the development that is not constructed, and any and all defects, breaks, or failures of the work due to faulty or inadequate materials or workmanship occurring within two (2) years following the date of signature by the Contractor of the Certificate of Compliance and Final Completion (on publicly financed public improvement projects) or following the date of acceptance of the public facilities for ownership and operation (for privately financed public improvement projects). Additionally, on privately financed public improvement projects, the warranty shall cover failures of the design by the Engineer of Record that are discovered during the same warranty period.

B. In addition to and not in lieu of any other warranty required under the Contract Documents, furnish any and all manufacturer's and installer's standard warranty forms setting forth terms, conditions, and limitations. Contractor shall enforce such warranties during the two-year warranty period described in **Subsection 103.16(A)**. Contractor hereby assigns such warranties to the City upon acceptance of the improvement by the City. Contractor shall execute any documents necessary to assign or transfer the warranty to the City.

C. Contractor's warranty provided for in this Section includes the repair of damage or disturbances to other improvements under, within, or adjacent to the work, whether or not caused by settling, washing, or slipping, when such damage or disturbance is caused, in whole or in part, from activities of the Contractor in performing their duties and obligations under the Contract Documents when such defects or damage occur within the warranty period.

D. If performance of warranty work results in a street being cut or dug up, the Contractor shall comply with **Subsection 103.17** at no expense to the City.

E. The Contractor's two-year warranty period and warranty guarantee shall, with relation to any required repair, be extended two years from the date of completion of such repair. If

failures have occurred during the warranty period, subsequent two-year warranty periods shall be required.

F. If the Contractor, after written notice, fails within 2 months to complete the necessary warranty work in compliance with the terms of this subsection, the City may have the defects corrected, and the Contractor and the surety shall be liable for all expenses incurred. In case of an emergency where, in the opinion of the Manager, delay would cause serious loss or damage, repairs may be made without notice being given to the Contractor, and the Contractor or the surety shall pay the cost of repairs. Failure of the Manager to act in case of an emergency shall not relieve the Contractor or the surety from liability and payment of all such costs or from any liability to third parties arising from the condition of the work.

G. City of Gresham waterline facilities that require repair or replacement during the two-year warranty period shall be repaired by the City or under the direction of the City and the Contractor and the surety shall be liable for all expenses incurred.

H. Additional maintenance and guarantee requirements for landscaping are described in **Subsections 209.03.03(J-K) and 209.03.04(E-F)**.

103.17 Street Cut/Dig Moratorium After Major Street Work

Moratorium After Major Street Work:

A. The surface of streets classified as an arterial or collector shall not be cut for a period of five years after acceptance by the City of a street surface improvement, including major maintenance work.

B. The surface of all other street classifications shall not be cut for a period of three years after acceptance by the City of a street surface improvement, including major maintenance work.

C. If such delay would cause undue hardship for the applicant, property owner, or other person, the Manager may grant an exception. Such an exception shall be subject to the applicant paying the estimated cost of the street repair described below or constructing the street repair described below. The required street repair for asphalt streets includes the following:

(1) The applicant shall restore the street cut with a 2-inch deep grind and 2-inch thick (minimum) asphalt concrete inlay.

(2) If the cut is approximately perpendicular to the roadway centerline, the grind and inlay described in (1) above shall extend 30 feet from both sides of the trench. If the street cut is contained entirely on one side of the roadway centerline, then only that half of the street is required to be rebuilt. If the street cut extends beyond the centerline of the roadway, the full street width shall be rebuilt.

(3) If the street cut is approximately longitudinal to the roadway centerline, the grind and inlay described in (1) above shall extend over the entire length of the trench and shall extend 30 feet beyond both ends of the trench. If the street cut is contained entirely on one side of the roadway centerline, then only that half of the street is required to be rebuilt. If the street cut extends beyond the centerline of the roadway, the full street width shall be rebuilt.

For any cuts on Portland Cement Concrete streets, restoration will be determined by the Manager and shall include the requirements of **Standard Detail 640, PCC Pavement Restoration**.

103.18 CONTRACTOR IS INDEPENDENT CONTRACTOR *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The Contractor shall perform the work required by the Contract as an independent contractor. Although the City reserves the right (i) to specify the desired results; (ii) to determine (and modify) the delivery schedule for the work to be performed; and (iii) to evaluate the quality of the completed performance, the City cannot and will not control the means or manner of the Contractor's performance. The Contractor is responsible for determining the appropriate means and manner of performing the work.

B. The Contractor represents and warrants that Contractor (i) is not currently an employee of the Federal Government or the State of Oregon, and (ii) meets the specific independent contractor standards of *ORS 670.600*. The Contractor represents and warrants that all subcontractors shall also meet such independent contractor standards.

C. The Contractor will be responsible for any federal or state taxes applicable to any compensation or payment paid to the Contractor under the Contract.

D. The Contractor is not eligible for any federal Social Security, unemployment insurance, state Public Employees' Retirement System, or workers' compensation benefits from compensation or payments to the Contractor under the Contract.

103.19 SUCCESSORS IN INTEREST

The provisions of the Contract shall be binding upon and shall inure to the benefit of the parties hereto, and their respective successors and approved assigns, if any.

103.20 CONSTRUCTION CONTRACTOR'S BOARD

A. For publicly financed public improvements, the Contractor shall be licensed with the Construction Contractors Board in accordance with *ORS 701.035 to 701.055*. All subcontractors performing work as described in *ORS 701.005(2)* (i.e., construction work) shall be licensed with the Construction Contractors Board in accordance with *ORS 701.035 to 701.055* before the subcontractors commence work. The Contractor and every subcontractor shall have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt under *ORS 279C.836(7), (8) or (9)*. The Contractor shall include in every subcontract a provision requiring the subcontractor to have a public works bond filed with the Construction Contractors Board before starting work on the project, unless exempt under *ORS 279C.836(7), (8) or (9)*. No Contractor or subcontractor on the list of disqualified contractors maintained by the Construction Contractor Board shall be retained or perform any Work.

B. For privately financed public improvements, the development permit holder shall be licensed with, or shall contract with a general contractor that is licensed with, the Construction Contractors Board in accordance with *ORS 701.035 to 701.055*. All subcontractors performing work as described in *ORS 701.005(2)* (i.e., construction work) shall be licensed with the Construction Contractors Board in accordance with *ORS 701.035 to 701.055* before the subcontractors commence work.

103.21 SEVERABILITY

If any term or provision of the Contract Documents are declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Contract Documents did not contain the particular term or provision held invalid.

103.22 MERGER CLAUSE *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

The Contract, Contract Documents, and all items identified therein, constitutes the entire agreement between the parties. No waiver, consent, modification, or change of terms of the Contract shall bind either party unless in writing and signed by both parties. Such waiver, consent, modification, or change, if made, shall be effective only in the specific instance and for the specific purpose given. There are no understandings, agreements, or representations, oral or written, not specified herein regarding the Contract. By its signature, the Contractor acknowledges it has read and understands the Contract and agrees to be bound by its terms and conditions.

103.23 NO THIRD-PARTY BENEFICIARIES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

The City and the Contractor are the only parties to the Contract and are the only parties entitled to enforce its terms. Nothing in the Contract gives or provides any benefit or right, whether directly, indirectly, or otherwise, to third persons unless such third persons are individually identified by name and expressly described as intended beneficiaries of the terms of the Contract.

103.24 EXAMINATION OF THE CONTRACT DOCUMENTS, SITE OF WORK, AND SUBSURFACE DATA

A. For publicly financed public improvements, the City shall make the project site reasonably available to prospective bidders for examination. Bidders may request to conduct site testing which request shall not unreasonably be withheld provided the Bidder provides adequate assurances that the site will be restored to its prior state and assumes all liability for any claims arising from the testing. The submission of an offer shall be conclusive evidence that the Bidder has investigated and is satisfied as to the site subsurface conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the Contract Documents. The City will not pay any costs incurred by any Bidder in the submission of an offer or in making necessary studies, subsurface investigations, or designs for the preparation of an offer.

B. For privately financed public improvements, the development permit holder shall be solely responsible to investigate and determine the subsurface conditions to be encountered and the character, quality, and quantities of work to be performed and materials to be furnished.

103.25 FAMILIARITY WITH LAWS AND ORDINANCES

A. The Bidder and the Contractor shall be familiar with all federal, state, and local laws, ordinances, and regulations that in any manner affect those engaged or employed in the work or the materials or equipment used in the proposed construction, or which in any way affect the conduct of the work. If the Bidder or the Contractor discovers any provision in the Contract Documents that is contrary to or inconsistent with any law, ordinance, or regulation, it shall immediately be reported to the Project Manager in writing.

B. Pursuant to *ORS 279C.525*, the following is a list of federal, state and local agencies that have enacted ordinances or regulations dealing with the prevention of environmental pollution and the preservation of natural resources that may affect the performance of the Contract.

Federal Agencies:
Agriculture, Department of
Army Corps of Engineers

Coast Guard
Defense, Department of
Energy, Department of
Environmental Protection Agency
Federal Energy Regulatory Commission
Federal Highway Administration
Forest Service
Geological Survey
Health and Human Services, Department of
Housing and Urban Development, Department of
Indian Affairs, Bureau of
Interior, Department of
Labor, Department of
Land Management, Bureau of
Mine Safety and Health Administration
Minerals Management Service
Mines, Bureau of
Occupational Safety and Health Administration
Reclamation, Bureau of
Solar Energy and Energy Conservation Bank
Soil Conservation Service
Transportation, Department of
U.S. Fish and Wildlife Service
Water Resources Council

State Agencies:

Administrative Services, Department of
Agriculture, Department of
Columbia River Gorge Commission
Consumer and Business Services, Department of
Energy, Department of
Environmental Quality, Department of
Fish and Wildlife, Department of
Forestry, Department of
Geology and Mineral Industries, Department of
Human Resources, Department of
Land Conservation and Development Commission
Parks and Recreation, Department of
Soil and Water Conservation Commission
State Lands, Division of
Water Resources, Department of

Local Agencies:

City Councils
County Commissioners, Board of
County Courts
County Service Districts
Design Commissions
Fire Protection Districts
Historical Preservation Commissions
Metropolitan Service Districts

Planning Commissions
Port Districts
Sanitary Districts
TriMet
Water Districts

C. The Contractor and their subcontractors shall obtain a City of Gresham business license prior to beginning any work within the City of Gresham.

104 AWARD AND EXECUTION OF THE CONTRACT

(Not applicable to privately financed public improvements)

104.01 AWARD OF THE CONTRACT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The City will award the Contract to the responsible Bidder with the lowest responsive offer.

B. While price extensions are required as a matter of convenience, in the event of error in extensions, the unit prices shall govern. In the event of discrepancy between the written and numerical amounts, the written prices will govern.

C. Award and issuance of the Contract for signing shall be made within forty-five (45) calendar days, unless otherwise specified, after the date of opening of offers.

D. If all responsive offers from responsible Bidders exceed the City's cost estimate, the City may elect to negotiate with the lowest responsive, responsible Bidder prior to awarding the Contract, in order to solicit value engineering and other options to attempt to bring the project within the City's cost estimate. Negotiation will not result in significant changes from the scope of the project in the Contract Documents.

E. Preference may be given to services, articles, or materials produced or manufactured in Oregon if price, fitness, availability, and quality are otherwise equal.

104.02 SELECTION PROTEST *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Upon selection of the Contractor, the Project Manager shall issue a Notice of Intent to Award. A Bidder adversely affected or aggrieved may protest the Notice of Intent to Award. No protest because of a solicitation provision, evaluation criteria, plan, specification or contract term that could have been raised as a Solicitation Protest will be considered. The selection protest must be submitted in writing within seven calendar days of the date of the Notice of Intent to Award. The protest shall be submitted to the Project Manager.

The selection protest will be denied unless the protester, in the discretion of the City, submits facts demonstrating that: all lower bids or higher ranked proposals are nonresponsive; the City has failed to conduct the evaluation of proposals in accordance with the criteria or processes described in the solicitation materials; the City has abused its discretion in rejecting the protestor's bid or proposal as nonresponsive; or the City's evaluation of bids or proposals or the contracting agency's subsequent determination of award otherwise violates state law. A written decision will be sent to the protester.

104.03 EXECUTION OF THE CONTRACT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The Bidder to whom award is made shall execute and return the Contract in the required number of copies, and shall furnish separate performance bond and payment bonds and certificates of insurance satisfactory to the Manager and Attorney within fifteen (15) days after the Project Manager issues the Contract. The date of the Contract will be the date the Manager or designee executes the Contract.

B. Drug Testing

(1) The Contractor awarded the Contract shall certify to the City that it has a drug-testing program in place for its employees that includes, at a minimum, the following:

(a) A written employee drug-testing policy,

(b) Required drug testing for all new Subject Employees or alternatively, required testing of all Subject Employees every 12 months on a random selection basis, and

(c) Required testing of a Subject Employee when the Contractor has reasonable cause to believe the Subject Employee is under the influence of drugs.\

(2) A drug-testing program that meets the above requirements will be deemed a "Qualifying Employee Drug-testing Program." An employee is a "Subject Employee" only if that employee will be working on the project job site.

(3) By executing and returning the Contract, the Contractor certifies, represents, and warrants to the City that a Qualifying Employee Drug-testing Program is in place at the time of execution, will continue in full force and effect for the duration of the Contract, and that the Contractor will comply with the provisions of **Subsection 103.03(C)**. Further, the City's performance obligation (which includes, without limitation, the City's obligation to make payment) is contingent on the Contractor's compliance with this representation and warranty.

104.04 TRANSFER OF THE CONTRACT AND INTERESTS THEREIN *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Excepting Surety assignment under the performance and payment bonds, the Contract is not assignable or transferable, nor shall Contractor delegate its responsibilities, to any other party or parties without the prior written consent of the Manager. Unless City expressly approves otherwise, no assignment, transfer, or delegation shall relieve Contractor of its obligations under this Contract. Any transfer, assignment or delegation without prior permission shall be void and the Manager may refuse to carry out the Contract either with the Contractor or the transferee, but all rights of action for any breach of the Contract by said Contractor are reserved to the City. No officer of the City, or any person employed in its service, is or shall be permitted any share or part of the Contract or is or shall be entitled to any benefit which may arise from the Contract.

B. Any assignment of money shall be subject to all proper setoffs and withholdings in favor of the City and to all deductions provided for in the Contract and particularly all money withheld, whether assigned or not, shall be subject to being used by the City for completion of the work in the event the Contractor should be in default therein.

104.05 PERFORMANCE AND PAYMENT BONDS; WARRANTY GUARANTEE

A. The following is not applicable to privately financed public improvements:

At the time of execution of the Contract, the Contractor shall furnish separate Performance and Payment Bonds written by a corporate surety, or other financial assurance approved by the Manager and Attorney, each in an amount equal to the contract price based upon the estimate of quantities and unit prices or lump sum as set forth in the Contract. The bonds shall be continuous in effect and shall remain in full force and effect until compliance with and fulfillment of all terms and provisions of the Contract, including the warranty obligation and any extension thereof pursuant to **Subsection 103.16**, all applicable laws, and the prompt payment of all persons supplying labor and/or material for prosecution of the work. The bonds or other financial assurance is subject to approval by the Manager and Attorney.

Contractor may request to furnish a separate warranty bond written by a corporate surety or other financial assurance, in an amount equal to 10% of the final Contract Price in lieu of the performance and payment bonds including the warranty obligation. The warranty bond or other financial assurance shall be in effect for a period of two years from the date of Final Completion. The Project Manager may require a separate warranty bond or financial assurance for any repairs done pursuant to the warranty obligation. Such separate warranty bond or financial assurance shall be for a period of two years from the date of completion of such repairs. The warranty bond or other financial assurance is subject to approval by the Manager and Attorney.

B. The following is not applicable to publicly financed public improvements:

(1) Prior to issuance of the Notice to Proceed for privately financed public improvement projects, a Guarantee of Completion shall be provided that meets the requirements of *Gresham Community Development Code (GCDC) Appendix 3 and A5.003* and is subject to approval by the Manager and Attorney. The Guarantee of Completion shall be conditioned upon compliance with and fulfillment of all terms and provisions of the *GCDC*, *Gresham Revised Code (GRC)*, the Contract Documents, and any agreement relating to the construction of the public improvements.

(2) A Warranty Guarantee pursuant to *GCDC A5.004* shall be required before the Engineer accepts the work for ownership and operation.

104.06 CERTIFICATE OF INSURANCE *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Work shall not commence until all insurance required by the Contract has been obtained and the Attorney has approved Certificate(s) of Insurance. The Contractor shall maintain insurance throughout the life of the Contract.

104.07 FAILURE TO EXECUTE THE CONTRACT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Failure on the part of the Bidder to whom the Contract is awarded to execute the Contract and to deliver the Contract, the required performance and payment bonds and the certificate of insurance shall be just cause for cancellation of the award, withdrawing of the Contract and forfeiture of the Bid Security to the City. Award may then be made to the next lowest responsible and responsive Bidder, or the work may be re-advertised, or otherwise, as the City may decide.

104.08 RETURN OF BID SECURITY *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

The bid security of unsuccessful Bidders will be returned after the offers have been opened and the Contract has been awarded. The City reserves the right to retain the bid security of the three (3) lowest Bidders until the Contract has been signed and returned. The bid security of the Contractor shall be returned upon execution of the Contract by the City.

105 SCOPE OF WORK

105.01 PLANS AND SPECIFICATIONS

The Contract Documents will govern the work to be done. Anything mentioned in the specifications and not shown on the plans, or shown on the plans and not mentioned in the specifications, shall be of like effect as though shown or mentioned in both. Specifications and plans referred to in any part of the Contract Documents shall be considered as being included in the document in which such reference is made. When a particular Standard Detail or Standard Specification is referred to, such reference shall be to the Standard Detail or Standard Specification that is in force at the time of the Notice to Contractors. The phrases, "Contractor shall", "Contractor will", etc. may not always be specifically stated in all paragraphs but is considered understood where not specifically stated otherwise.

105.02 PRECEDENCE OF THE CONTRACT DOCUMENTS

In case of conflict, the order of precedence of the following documents in controlling the work shall be:

1. CIP Agreement (for publicly financed public improvements)
2. Offer (for publicly financed public improvements)
3. Permits from outside agencies required by law
4. Special Provisions
5. Project Specific Plans (for publicly financed public improvements)
6. Unique Specifications
7. The ***Public Work Standards***, including Design Standards, Standard Specifications and Standard Details
8. Approved Plans (for privately financed public improvements)
9. Oregon Standard Specifications for Construction (latest revision)

Addenda, change orders, supplemental agreements, and approved revisions to plans and specifications will take precedence over the contract documents listed above.

Any bulletins, standards, rules, methods of analysis or test, codes and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents specified herein refer to the latest edition thereof, including any amendments, updates, or new editions thereto that are in effect and published at the time of the Notice to Contractors for publicly financed public improvements or date of development application for privately financed public improvements. If a conflict exists between these hereabove mentioned documents and the ***Public Works Standards***, the ***Public Works Standards*** will take precedence.

105.03 SHOP DRAWINGS AND OTHER SUBMITTALS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Plans and specifications furnished and included with the Contract Documents indicate the work proposed and the results that are intended to be accomplished.

B. Unless otherwise specified, furnish all layout, detail, shop, and working drawings, product data and samples required by the plans and specifications to be submitted or as requested by the Engineer. Drawings shall be of sufficient size and scale to clearly show details and six (6) copies shall be provided or a single copy shall be submitted electronically. After review and approval by the Engineer, two copies will be returned to the Contractor.

C. By submitting drawings, product data and samples, the Contractor represents that they have determined and verified all materials, field measurements, and field construction criteria related thereto, and that they have checked and coordinated the information contained within such submittals with the requirements of the work and of the Contract Documents and that they are satisfied they conform to the Contract Documents.

D. All required drawings, product data and samples shall be furnished to the Project Manager for review and any required testing before any of the work or related work is performed, or products or material ordered prior to the Project Manager's review and completion of any testing will be at the Contractor's risk.

E. The Engineer will review all drawings, product data, and samples and conduct such tests as are required by the Contract Documents within a reasonable time but in no event will the Engineer be required to complete such review or conduct such tests in less than fourteen (14) days after submission. The Engineer will return marked-up submittal copies indicating one of the following actions:

(1) If review and checking indicate no exceptions, copies will be returned marked "NO EXCEPTIONS TAKEN" and work may begin immediately on incorporating the material or equipment covered by the submittal into the work.

(2) If review and checking indicate limited corrections are required, copies will be returned marked, "Make Corrections Noted", and upon making the corrections noted, work may begin immediately to incorporate the material or equipment covered by the submittal into the work.

(3) If review and checking indicate insufficient or incorrect data have been submitted, copies will be returned marked "REVISE AND RESUBMIT." No work may begin on incorporating the material or equipment covered by the submittal into the work until the submittal is revised, resubmitted, and returned marked either "NO EXCEPTIONS TAKEN" OR "MAKE CORRECTIONS NOTED."

(4) If review and checking indicate the material or equipment submittal is unacceptable, copies will be returned marked "REJECTED." No work may begin on incorporating the material or equipment covered by the submittal into the work until a new submittal is made and returned marked either "NO EXCEPTIONS TAKEN" OR "MAKE CORRECTIONS NOTED."

(5) If review and checking indicate additional information is required, copies will be returned marked "SUBMIT SPECIFIED ITEM." Work may begin immediately on incorporating the material or equipment covered by the submittal into the work, only if it is not affected by the item to be submitted. If any material or equipment is affected, no work may begin on incorporating that material or equipment into the work until it and the submittal are submitted and returned marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

F. The review by the Engineer of any shop drawings, product data, samples, construction methods and equipment or other submittals is only for conformance with the general design concept of the project and does not extend to consideration of structural integrity, safety,

detailed compliance with Contract Documents, or any other obligation of the Contractor. Any work shown is subject to the requirements of the plans and specifications. The Contractor is responsible for confirming and correlating all dimensions; fabricating, and construction techniques; coordinating their entire work in strict accordance with the Contract Documents. The review does not relieve the Contractor from their obligation fully to perform all requirements of the Contract Documents, nor shall such review give rise to any right of action or suit in favor of the Contractor or third persons against the Engineer or the City.

105.04 Changes in The Work

A. Without notice to a surety, the City may, at any time, order additions, deletions or revisions in the Work. A written amendment, a change order, or a work directive will authorize these additions, deletions or revisions.

B. Upon receipt of any such document, the Contractor shall promptly proceed with the work under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

105.05 Force Account Work *(Not applicable to privately financed public improvements)*

The Contractor shall perform work on a force account basis upon written notice by the Project Manager. If the Project Manager determines the work increases the amount due under the Contract, payment will be made pursuant to **Subsection 109.04(D)(3)**, Method 3 – Force Account Work.

105.06 Salvage

When shown or specified, carefully salvage and stockpile within the construction area all castings, pipe, and any discarded facilities, to be salvaged by the City. If directed by the Project Manager, the Contractor shall deliver any discarded facilities to a location designated by the Project Manager.

106 Prosecution and Progress of Work

106.01 Contractor's Construction Schedule

A. At least one (1) week in advance of starting work, submit for written approval a proposed construction schedule to the Project Manager. The Contractor shall not commence work until the construction schedule is approved by the Project Manager.

B. If it is desirable to carry on operations in more than one location simultaneously, submit a schedule that addresses all locations at least one (1) week in advance of beginning such operations.

C. If the Contractor's proposed construction schedule does not meet the necessary construction program schedule as determined by the Project Manager, immediately submit a revised construction schedule for approval. The Contractor shall not commence work until the revised construction schedule is approved by the Project Manager.

D. The schedule shall show the proposed order of work and indicate the time required for completion of the major items of work. This working schedule shall take into account traffic with the least practicable interference therewith and the orderly, timely, and efficient prosecution of work. It will also be used as an indication of the sequence of the major construction operations and as a check on the progress of work.

E. At any time the Project Manager considers that the work, or any portion of the work, is more than 10% behind the approved schedule, or whenever the Project Manager reasonably requests, the Contractor shall submit information to demonstrate how the work will be accomplished within the approved schedule or submit an updated schedule to the Project Manager for review and approval.

F. Contractor shall not be entitled to any compensation for delay if the work is completed within the contract time but after the approved contractor's schedule.

106.02 PRECONSTRUCTION CONFERENCE

Attend a preconstruction conference, if requested, at a time prior to start of work designated by the Project Manager. Comply with information and instructions provided at the preconstruction conference as recorded in the minutes of the meeting. Representative(s) of the Contractor expected to be directly involved with the project shall be in attendance.

106.03 CONTRACTOR'S REPRESENTATIVE

Designate in writing before starting work an authorized representative who shall have complete authority to represent and to act for the Contractor. The Contractor or its authorized representative shall supervise the work, and shall be present onsite continually during its progress. If the Contractor or its authorized representative is not present, the Engineer may give directions to the apparent person in charge at the site and such directions shall be received and followed. Any direction will be confirmed in writing upon request from the Contractor.

106.04 NOTICE TO PROCEED

A. The following is not applicable to privately financed public improvements:

(1) Unless stated otherwise in the Special Provisions, written Notice to Proceed will be given by the Project Manager within 30-days of the date of the Contract. Do not commence work under the Contract until such written notice has been given. Notify the Project Manager forty-eight (48) hours in advance of the time and place work will be started.

(2) Notice to Proceed may be delayed by the Project Manager up to an additional thirty (30) days (for a total of sixty (60) days) from date of the Contract if, in the Project Manager's opinion, necessary easements or permits have not been obtained, or required utility relocation, construction, or reconstruction has not been completed or has not progressed to a degree that will allow work to commence.

(3) Commence work within 10 working days after the date of the Notice to Proceed, or such other date as may be fixed by the Notice to Proceed. The date work is required to begin establishes the commencement date of the Contract time.

B. The following is not applicable to publicly financed public improvements:

(1) Work may not commence until the Project Manager issues a Notice to Proceed.

(2) A Notice to Proceed for privately financed public improvement projects shall not be issued unless the subject development, and any other development of the developer within the City, is in substantial compliance with all applicable federal, state, and local laws, rules, regulations, permits, and the Contract Documents relating to such developments. If there is a material violation of any such requirement, the Manager may elect to withhold the Notice to Proceed for privately financed public improvement

projects until such time as the violation has been resolved to the satisfaction of the Manager.

106.05 CONTRACT TIME

A. The following is not applicable to privately financed public improvements:

(1) Time shall be considered of the essence of the Contract.

(2) Upon commencement of work, the Contractor shall provide adequate labor, materials, and equipment, and work shall be performed vigorously and continuously in accordance with a schedule that will ensure completion within the specified time limit. Failure to diligently pursue the work may jeopardize additional contract time.

(3) Work shall be completed within the specified contract time.

B. The following is not applicable to publicly financed public improvements:

(1) Privately financed public improvement projects shall be completed within two years of the issuance of the Notice to Proceed unless the Manager extends the completion date. The Project Manager may require an additional Guarantee of Completion and impose other conditions before granting such an extension.

(2) When the improvements are sufficiently complete, as determined by the Project Manager, the City will inspect the improvements and create a list of any deficient items. These items must be rectified prior to the City's acceptance of the public improvements.

(3) Privately financed public improvements shall not be accepted for ownership and operation by the City until the Project Manager determines to its satisfaction that the Work is complete and in compliance with the Contract Documents and all other applicable requirements, the Warranty Guarantee is in place, and all fees and charges have been paid.

106.06 SUSPENSION OF WORK

A. If the work is suspended for public interest:

The Manager may temporarily suspend work on the project wholly or in part for any reason deemed to be in the public interest. In the event of such suspension, the Manager shall, except in emergency and except as hereinafter provided, give the Contractor three (3) days notice.

(1) For publicly financed public improvements, work shall be resumed within five (5) days after notice has been given by the Manager to the Contractor to do so. The Manager shall allow the Contractor an extension of time for completion corresponding to the total period of temporary suspension. The Contractor will be entitled to recover damages limited to reimbursement for necessary rental of unused equipment, services of watch persons, documented direct overhead costs, documented direct unavoidable expenses accruing by reason of the suspension, plus fifteen percent (15%) of the foregoing to cover Contractor's profit. The Contractor shall not be entitled to indirect costs or any other damages arising out of the delay, including but not limited to interruption of schedules, or any other impact claim or ripple effect.

B. If work is suspended by the Manager:

The Manager may immediately suspend work on the project, wholly or in part, as directed by the Manager, for reasonable periods of time as the Manager may deem necessary, when conditions are deemed unsuitable for satisfactory performance of the work.

(1) For publicly financed public improvement projects the City shall allow the Contractor an extension of time for completion corresponding to the total period of suspension, but the Contractor shall not be entitled to reimbursement for any costs or damages arising under this clause.

C. If work is suspended for cause:

The Manager may immediately suspend work on the project, wholly or in part, for reasonable periods of time if the Manager determines that the Contractor has failed to: (1) correct unsafe conditions for working personnel, the general public, or the City's employees, (2) immediately correct defective and unacceptable work in accordance with **Subsection 107.16**, (3) carry out provisions of the Contract Documents, or (4) carry out change orders or directives. The Manager may direct all or a portion of the work be suspended and the conditions under which work may commence.

(1) For publicly financed public improvements, Contractor may be entitled to a time extension or compensation, but only if it is determined that the suspension did not arise from the actions, inactions or omissions of Contractor in breach of the Contract Documents. The Contractor shall not be entitled to indirect costs or any other damages arising out of the delay, including but not limited to interruption of schedules, or any other impact claim or ripple effect.

D. Voluntary suspension by the Contractor:

Such suspension shall not relieve the Contractor from the responsibility to complete the work within the prescribed time specified in the Contract Documents. Should operations be discontinued, the Contractor shall notify, in writing, the Project Manager at least twenty-four (24) hours in advance of resuming operations.

(1) For publicly financed public improvement projects, there shall be no voluntary suspension or slowing of operations without the prior written approval of the Project Manager and such approval shall not relieve the Contractor from the responsibility to complete the work within the prescribed time in the Contract Documents.

E. Responsibilities of the Contractor:

(1) At the commencement of and during any suspension of work, protect all work performed to prevent any damage or deterioration of the work. Provide temporary protection devices to warn, safeguard, protect, guide, and inform traffic during suspension, the same as though the work had been continuous and without interferences.

(2) Bear all costs for providing suitable provisions for traffic control and for maintenance and protection of the work during suspension unless the suspension was for convenience.

F. In all cases of suspension, except voluntary suspension by the Contractor, work will be resumed only upon written order of the Project Manager.

106.07 DELAYS AND EXTENSIONS OF TIME *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. If the Contractor is significantly delayed due to court orders enjoining the prosecution of the project, unavoidable strikes, earthquake, flood, cloudburst, tornado, hurricane, or other phenomenon of nature of catastrophic proportions or intensity, unusual and extraordinary action of the elements that are of such severity to stop all progress of the work, the Contractor shall, within forty-eight (48) hours of the start of the occurrence, give notice to the Project Manager of the cause of the potential delay and estimate the possible time extension involved. Within ten (10) days after the cause of the delay has been remedied the Contractor shall give notice to the Project Manager of any actual time extension requested as a result of the aforementioned occurrence in accordance with **Subsection 109.05**, Claims and Notice.

B. No extension of time will be considered for weather conditions normal to the area and time of year in which the work is being performed. Delays in delivery of equipment or material purchased by the Contractor or subcontractors (including the City-selected equipment) shall not be considered as a just cause for delay, when timely ordering would have made the equipment available. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials. Extensions of time will be considered for delayed delivery of the City-specified equipment "without equal."

C. Within a reasonable period after the Contractor submits to the Project Manager a written request for an extension of time, the Project Manager will make the decision on each request. All extensions of time shall be approved by the Manager.

D. An adjustment of Contract time as herein provided shall be the Contractor's sole remedy for any delay in completion of the project arising from causes beyond the control of the Contractor, except for unreasonable delay caused by acts or omissions of the City or persons acting therefore. In no event shall the Contractor be entitled to collect or recover any damages, loss or expense incurred by reason of such delay, except for an unreasonable delay caused by acts or omissions of the City or persons acting therefore.

E. If the Contractor is delayed due solely to a breach by the City, the Contractor will be entitled to recover damages limited to reimbursement for necessary rental of unused equipment, services of watch persons, documented direct overhead costs, documented direct unavoidable expenses accruing by reason of the suspension, plus fifteen percent (15%) of the foregoing to cover Contractor's profit. The Contractor shall not be entitled to indirect costs or any other damages arising out of the delay, including but not limited to, interruption of schedules, or any other impact claim or ripple effect. If a delay is caused by the City and the Contractor (joint delay), the Contractor shall only be entitled to a time extension.

106.08 CONTRACT INCENTIVE AND LIQUIDATED DAMAGES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. If the Contractor fails to complete the project or to deliver the supplies or perform the services within the time specified in the Contract or any extension thereof by the City, the parties agree that the actual damage to the City for the delay will be substantial but will be difficult or impractical to determine. If the Contractor completes the project before the time specified in the Contract or any extension thereof by the City, the City shall receive a benefit by reason of the early completion.

B. It is therefore agreed that, if a per diem amount for a contract incentive is included in a Special Provision, the City shall pay to the Contractor the per diem amount for each and every calendar day the work is substantially and/or finally complete as specified before the time established in the Special Provision. Notwithstanding whether a contract incentive is provided, the Contractor will pay to the City, not as a penalty but as liquidated damages, the per diem amount for each and every calendar day elapsed in excess of the Contract time or the final adjusted Contract time for final completion applicable to the work required under the Contract.

C. Permitting the Contractor to continue and finish the work or any part thereof after the Contract time or adjusted Contract time, as pertinent, has expired shall in no way operate as a waiver on the part of the City or any of its rights under the Contract.

D. Payment of a contract incentive or liquidated damages shall not release the Contractor from obligations in respect to the fulfillment of the entire Contract, nor shall the payment constitute a waiver of the City's right to collect damages which may be sustained by failure of the Contractor to carry out the terms of the Contract, it being the intent of the parties that the contract incentive or liquidated damages be full and complete payment only related to the timely completion of the work.

106.09 Record Drawings

The Contractor shall maintain, at the site, one set of clean, readable plans, specifications, full-size drawings, shop drawings, and supplemental drawings that shall be available for inspection by the City. Upon completion of the work, the Contractor's field as-built drawings shall be turned over to the Project Manager prior to final payment or release of funds by the City. For privately financed public improvements, submission of drawings, conforming to **Subsection 2.06**, is required prior to final acceptance.

106.10 Conflicts, Errors, Omissions, and Additional Drawings

Contractor shall check and compare all plans and specifications prior to construction and notify the Engineer of Record and the Project Manager of any doubts regarding their meaning, any discrepancies, and any omissions in order to permit correction by the Engineer of Record. Coordination of plans and specifications is intended. Should any work or materials be reasonably required or intended for carrying the project to completion that are omitted on the plans and specifications, furnish same as fully as if particularly delineated or described. The intent of the plans and specifications is to show and describe a complete project within the limits stated. Dimensions shown on plans shall be followed, rather than scale measurements. Whenever the plans are not sufficiently detailed or explicit, the Engineer of Record will be required to furnish additional detail drawings or written instructions at the request of the Contractor or the City. The Contractor shall perform the work in accordance with the additional details or instructions.

106.11 The City's Right to Do Work

Failure or refusal to comply with any of the terms or conditions of the Contract Documents will permit the City to supply or correct any deficiency or defect or take other appropriate action without prejudice to any other remedy. Such action by the City shall be taken only after seven (7) days notice by the Manager to the Contractor and their surety, unless in the judgment of the Manager an emergency or danger to the work or to the public exists, in which event action of the City as set forth above may be taken without any notice whatsoever. The cost of such action by the City shall be at the Contractor's expense and shall be billed to the Contractor or deducted from payment owed the Contractor. The Contractor remains fully responsible for all aspects of the Contract Documents, even if this right is exercised. Nothing in this subsection shall be construed to require the City to do any work to cure any deficiency or defect.

106.12 TERMINATION FOR DEFAULT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. If the Contractor should be adjudged bankrupt, or if the Contractor should make a general assignment for the benefit of their creditors, or if a receiver should be appointed on account of insolvency, or if the Contractor should refuse to or fail to supply enough properly skilled workers, proper materials, or proper equipment for the efficient prosecution of the project, disregard laws, ordinances or the instructions of the City, or is otherwise in material breach of any provision of the Contract Documents, the Manager may, without prejudice to any other right or remedy and after giving the Contractor and its surety seven (7) days written notice, terminate the Contract and take possession of the site and of all materials, tools, and appliances thereon required by the Contract Documents whether on the site or not, for which the Contractor has received partial payment, and finish the work by whatever method it may deem expedient.

B. In the event action as above indicated is taken by the City, the Contractor, or its surety, shall provide the City with immediate and peaceful possession of all of the materials, tools, and appliances located on the site as well as all other materials whether on the site or not, on which the Contractor has received any progress payment. Upon termination, in the event that the surety does not complete the Contract, at the election of the City, the Contractor shall assign any and all subcontracts and material contracts to the City or the City's designee. Further, the Contractor shall not be entitled to receive any further payment until the work is completed.

C. On completion of the work by the City, determination shall be made by the Project Manager of the total amount the Contractor would have been entitled to receive for the work, under the terms of the Contract, had the Contractor completed the work. If the difference between said total amount and the sum of all amounts previously paid to the Contractor, which difference will hereinafter be called the "unpaid balance," exceeds the expense incurred by the City in completing the work, including expense for additional managerial and administrative services, such excess will be paid to the Contractor, with the consent of the surety. If the expense incurred by the City exceeds the unpaid balance, the amount of the excess shall be paid to the City by the Contractor or its surety. The expense incurred by the City as herein provided, and the damage incurred through the Contractor's default, shall be as determined and certified by the Manager.

D. In addition to and apart from the above-mentioned right of the City to terminate the Contract, the Contract may be terminated at the election of the City for any willful failure or refusal on the part of the Contractor to faithfully perform the Contract according to all of its terms and conditions; provided, however, that in the event the City should terminate the Contract, neither the Contractor nor its surety shall be relieved from damages or losses suffered by the City on account of the Contractor's breach of the Contract.

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

F. None of the foregoing provisions shall be construed to require the City to complete the work, to waive or in any way limit or modify the provisions of the Contract, including damages suffered by the City on account of the project not being completed within the time prescribed or other breach.

106.13 TERMINATION IN THE PUBLIC INTEREST *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. It is hereby agreed that the City has the right to terminate the Contract in whole or in part when it is considered to be in the public interest.

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

The amount to be paid to the Contractor:

(1) Shall be determined on the basis of the Contract price in the case of any fully completed separate item or portion of the work for which there is a separate lump sum or unit price; and

(2) In respect to any other work, the Contractor will be paid a percent of the Contract price equal to the percentage of the work completed.

107 CONTROL OF WORK

107.01 AUTHORITY OF THE PROJECT MANAGER AND ENGINEER

A. The Project Manager will decide all questions that may arise as to quantity, quality, and acceptability of materials furnished and work performed, the rate of progress of the work; interpretation of the plans and specifications; the measurement of all quantities; and the acceptable fulfillment of the Contract Documents on the part of the Contractor. The Project Manager is not obligated to pay for quantities incorporated in the project in excess of quantities estimated in the Schedule of Prices unless the Project Manager or their designee has approved such overrun. The Project Manager's estimates, decisions, and approval signify favorable opinion and qualified consent; it does not carry with it certification or assurance of completeness, quality, or accuracy concerning details. Such approval does not relieve the Contractor from responsibility for errors, improper fabrication, improper construction methods, and non-conformance to requirements, or for deficiencies within their control.

B. All work to be done under the Contract Documents will not be considered completed until it has passed final inspection by the Engineer and is accepted by the Manager. It is further understood that the authority of the Engineer is such that the Contractor shall at all times carry out and fulfill the instructions and directions of the Engineer insofar as they concern the work to be done under the Contract Documents.

C. The Project Manager shall have the authority to order unacceptable work to be corrected, removed or replaced, and unauthorized work to be removed and, pending completion of such order, to deduct the estimated cost thereof from any monies due, including retainage, or to become due the Contractor. This authority shall take precedence over any and all requirements for payment.

D. In the Engineer's sole discretion, minor defects in the work may be accepted. These may be subject to a reasonable deduction from the Contract price or other credits to the City. Such determination by the Engineer shall be final.

E. The Inspector, Project Manager or Engineer is not authorized to waive any written notice required of the Contractor by the Contract Documents.

107.02 Authority and Duties of Inspectors

A. The City may designate persons to inspect material used and all work done. Such inspection may extend to any or all parts of the work and to the preparation or manufacture of materials to be used. Inspectors are not authorized to change the provisions of the Contract Documents. Contractor remains responsible for the quality of the work and compliance with all specifications notwithstanding that work has passed inspection. Inspection approval does not constitute final approval by City. An Inspector is placed on the work to keep the Project Manager informed of progress of the work and the manner in which it is being done. In addition, the Inspector shall call to the attention of the Contractor any deviation from the plans or specifications. An Inspector is not authorized to inspect, accept, or approve any changes to the work in the Contract Documents unless such changes have been previously approved by the City and the Engineer of Record.

B. An Inspector will not be authorized to approve or accept any portion of the work or to issue instructions contrary to the plans and specifications. Furthermore, the Inspector is not authorized to waive any written notices required by the Contract Documents. The Inspector will have authority to reject defective material and to suspend any work that is being improperly done, subject to final decision by the Engineer.

C. In instances where the Contractor did not afford the Inspector appropriate opportunity or notice to inspect, the Inspector may require the removal and replacement of the un-inspected item(s) at no expense to the City.

107.03 Responsibility of The Contractor

A. Do all work and furnish all labor, materials, equipment, tools, and machines necessary for the performance and completion of the project in accordance with the Contract Documents. Be obligated to determine and be responsible for the method of construction.

B. The Contractor shall be solely liable for any accident, loss, or damage happening to work referred to in the Contract Documents prior to completion and acceptance thereof.

107.04 Notification of Utilities and Agencies

A. Obtain prior approval from the Transportation Manager for closing or partial closing of any street. Give at least two working days advance notice of such closure to all agencies providing emergency services, including without limitation police, fire, and ambulance services. Notification shall include, but not be limited to, the time of commencement and completion of work, names of streets or location of alleys to be closed or partially closed, schedule of operations, and routes of detours where applicable.

B. When performing work in streets and easements, notify all of the affected utilities and local agencies about the operations so as to properly coordinate and expedite the work in such a manner as to cause the least amount of conflict and interference between the operations and those of other agencies.

C. The Contractor and its subcontractors must comply with all provisions of *ORS 757.542 to 757.562 and 757.993* and *OAR Chapter 952, Division One*, including notification of all owners of underground facilities at least forty-eight (48) business day hours but not more than ten (10) business days before beginning work. Contact the City of Gresham to acquire the current list of utility providers and notify them at least 2 working days before commencing any work on the project.

D. The City, for publicly financed public improvement projects, shall relocate or cause to be relocated all privately or publicly owned utility conduits, lines, poles, mains, pipes, and such other facilities where such relocation is necessary in order to conform said utility and other facilities with the plans and ultimate requirements of the project. The Contractor, for privately financed public improvement projects, shall coordinate relocation of all privately or publicly owned utility conduits, lines, poles, mains, pipes, and such other facilities with the utility owner where such relocation is necessary in order to conform said utility and other facilities with the plans and ultimate requirements of the project.

107.05 Utilities and Existing Improvements

A. Information shown on the plans as to location of utilities and associated appurtenances, existing improvements, and all topographical features is provided for the Contractor's information and convenience and is not in any way warranted to be accurate by the City. The Contractor shall verify all such information and shall deal with varying conditions at its own expense.

B. Operation of water valves and hydrants by unauthorized personnel is strictly prohibited. Obtain written permission from and pay any fee required from the water authority in whose jurisdiction the work is being performed prior to using hydrant water.

C. The Contractor is responsible to provide for the flow of sewers, drains, or watercourses interrupted during the progress of the work, and restore such drains or watercourses as approved by the Engineer at no additional cost to the City.

D. The Contractor is responsible for all costs for the repair of any and all damage to any utility, whether previously known or disclosed during the work, as may be caused by the work. Maintain in place utilities not shown on the drawings to be relocated or altered by others. If the Contractor requires temporary relocation, for convenience or because of a method of construction or as a result of site conditions, the Contractor shall bear all costs for said temporary relocation and must obtain the appropriate approvals from the City and the utility prior to relocation. Maintain utilities that have been relocated by others in their relocated positions in order to avoid interference with structures that cross the project work.

E. The Contractor must make excavations and borings ahead of work, as necessary, to determine the exact location of interfering utilities or underground structures. If the Contractor damages a utility, the utility owners shall have the right to enter upon the right-of-way and upon any structure therein for the purpose of making new installations, changes, or repairs. Conduct operations so as to provide the time needed for such work to be accomplished during the progress of the improvement, at no additional cost to the City.

F. It is understood that there will be interfering utilities, service laterals, and other underground pipes, drains, or structures encountered on underground projects that are not shown or are shown incorrectly on the plans and/or have not been previously discovered in the field. The Contractor agrees this is a normal and usual occurrence in the construction of underground improvements. Furthermore, the Contractor understands and agrees that work in some cases must be done in close proximity to said utilities and underground pipes, drains, and structures not shown or shown incorrectly on the plans which may require a change in operations and may cause sloughing of the trench, additional traffic control, additional excavation, backfill and restoration costs, and time. The Contractor agrees that these occurrences are usual and ordinary on underground projects and are reflected in the offer and construction schedule.

G. The Engineer will require a reasonable amount of time to perform design changes necessitated by directly conflicting utilities and/or the utility owners will require a reasonable amount of time to make necessary utility relocations.

H. The Contractor agrees to provide for these conflicts and interferences and agrees to provide for a reasonable amount of time for design changes and/or utility relocations due to said interference, that the cost of these conflicts and interferences has been incorporated into the offer, and Contractor understands that no additional compensation for interruption of schedule, extended overhead, delay, or any other impact claim or ripple effect or any other costs whatsoever or additional time will be made for these conflicts or interferences.

107.06 Survey Service

A. For publicly financed public improvement projects, the Contractor shall give notice to the Project Manager not less than three working days in advance of when survey services will be required in connection with the laying out of any portion of the work.

B. The Engineer of Record will furnish and set construction stakes establishing lines and grades as determined necessary for all work under the Contract Documents. The Contractor will be responsible for maintaining the stakes provided to areas of work.

C. The Engineer of Record will furnish appropriate offset lines and grades as deemed necessary for all projects including those involving trenching operations. The Contractor will be responsible for the transfer of the offset lines or grades into the ditch, to batter boards, string lines, or any other point within the work. Work done without lines and grades having been established by the Engineer of Record or work done beyond the lines and grades will be considered as unauthorized and will not be paid for and may be ordered removed, replaced, or corrected at no expense to the City.

D. The Engineer of Record shall furnish cut sheets to the Inspector prior to construction of the facility.

E. Permanent property corners must be set prior to final inspection and comply with *ORS 92*.

107.07 Protection of Survey Markers

No portion of this subsection is intended to replace any of the *Oregon Revised Statutes* or *Oregon Administrative Rules* pertaining to the act of surveying, and strict adherents to state law must be observed.

A. Permanent Survey Markers

Notify the Engineer of Record not less than three working days prior to starting work in order that the Engineer of Record may take necessary measures to ensure the preservation of survey monuments, boundary corners, stakes, lot corners, and benchmarks and other accessories. Do not disturb permanent survey monuments, boundary corners, stakes, lot corners benchmarks and other accessories without the consent of the Engineer of Record. The Contractor shall bear the expense of replacing any that may be disturbed. All monument replacement or destruction must comply with *ORS 209*.

When a change is made in the finished elevation of the pavement of any roadway in which a permanent survey monument is located, preserve the monument by adding or adjusting the monument box to the new grade at no expense to the City.

B. Construction and Survey Markers

The Contractor shall preserve construction survey stakes and marks for the duration of their usefulness during construction. If any construction survey stakes are lost or disturbed during the work by the Contractor and its subcontractors and in the judgment of the Engineer need to be replaced, such replacement shall be by the Engineer of Record at no expense to the City. The cost of replacement may be charged against, and deducted from, payments for Contract work.

107.08 PROTECTION OF PROPERTY

The Contractor shall:

A. Protect all public and private property insofar as it may be endangered by operations and take every reasonable precaution to avoid damage to such property.

B. Restore and bear the cost of any public or private improvement, facility, structure, or land and landscaping within the right-of-way or easement which is damaged or injured directly or indirectly by or on account of an act, omission, or neglect in the execution of the work. Restore to a condition substantially equivalent to that existing before such damage or injury occurred, by repairing, rebuilding, or otherwise effecting restoration thereof, or if this is not feasible, make a suitable settlement with the owner of the damaged property.

C. Give reasonable notice, typically 72 hours, to occupants of buildings on property adjacent to the work to permit the occupants to remove vehicles, trailers, and other possessions as well as salvage or relocate plants, trees, fences, sprinkler systems, or other improvements in the right-of-way which are designated for removal or which might be destroyed or damaged by work operations.

D. Protect all designated trees, lawns, and planted areas within the right-of-way or easements. Restore all on-surface, disturbed areas by methods as set forth in the Special Provisions. If conditions are such that the method specified cannot be done, provide erosion control surface covering of such quality and quantity as will prevent erosion from occurring, without adverse impacts to the environment, at no additional cost to the City.

E. Review with the Engineer of Record the location, limits, and methods to be used prior to clearing work. Clearing and grubbing shall be performed in strict compliance with all local, state, and federal laws and requirements pertaining to clearing and burning, and particularly in conformity with the provisions of *ORS Chapter 477*, and all subsequent amendments, which require, among other things, filing with the State Forester a general description of the right-of-way to be cleared before the start of clearing operations. Obtain the required permit from the State Forester and perform clearing work in conformance thereto.

107.09 RIGHTS-OF-WAY, EASEMENTS, AND PREMISES

Confine construction activities within property lines, rights-of-way, limits of easements, and limits of permits as shown or specified in the Contract Documents unless arrangements are made with the owner(s) of adjacent private property. If additional space or property is needed to accommodate the Contractor's method for construction of the work or for the convenience of the Contractor, the Contractor shall bear all related costs and responsibilities. Prior to the use of any private property outside the specified boundaries, submit to the Project Manager written permission from the property owner(s).

Do not unreasonably encumber the specified work areas with materials and equipment. Obtain and bear the costs of permits for special occupancy and use of the specified work areas from the proper agencies. Comply with all requirements regarding signs, advertisements, fires, and smoking.

107.10 Use of Work During Construction

A. The City shall have the right to take possession of and use any completed or partially completed portions of the work. Such use shall not be considered as acceptance of the work or portions thereof.

B. Such action by the City will not relieve the Contractor of responsibility for injury or damage to said completed portions of the work resulting from use by public traffic, action of the elements, the Contractor's operations, defective work, or negligence, or from any other cause, except for injury or damage resulting from the City's negligence. The Contractor will not be required to again clean up such portions of the work prior to final acceptance, excepting for such clean up as results from the Contractor's operations or defective work. Use of any completed or partially completed portions of the work does not relieve the Contractor from the warranty responsibility nor shall the warranty period commence to run until final completion and acceptance of the work.

107.11 Furnishing Temporary Services and Facilities

When necessary or when directed by the Engineer, install, furnish, and maintain temporary light, power, water, and any temporary services or facilities complete with connecting piping, wiring, lamps, and similar equipment during construction of the work, including testing and start up. Remove temporary facilities upon completion of work. Obtain all permits and bear all costs in connection with temporary services and facilities. Conform to applicable statues, rules, codes, and other requirements in the use of these facilities.

107.12 Verbal Agreements or Representations

No verbal agreement or conversation by or with any officer, agent, or employee of the City, either before or after execution of the Contract, shall affect or modify any of the terms or obligations contained in any of the Contract Documents. Any such verbal agreement or conversation is in no way binding upon the City.

107.13 Environmental Pollution Control

A. During performance of the work, the Contractor's operations shall conform to applicable laws of the state and Federal Government and regulations of the Oregon Department of Environmental Quality, other agencies of the state and Federal Government, the *City of Gresham Erosion Prevention and Sediment Control Manual*, as well as other local ordinances and resolutions designed to prevent, control, and abate environmental contamination, including but not limited to handling and disposal of pollutants or hazardous wastes.

B. Contractor shall obtain City’s approval prior to bringing onto the work site any hazardous or toxic material or substance as defined by law or regulation. Contractor shall properly handle, use and dispose of such substances as provided by the manufacturer and any applicable law or rule; shall be responsible for promptly reporting to the appropriate agency and to City any spill, release, leak or discharge of such substances and for containment and clean-up in compliance with all laws and regulations.

C. Unless disposition of known environmental contaminants or hazardous or toxic substance as provided for in the contract documents, Contractor immediately shall notify City of any

hazardous substance, as defined by law or rule, discovered or encountered during performance of the work. Contractor immediately shall stop work in the area of such contaminants, take steps to contain the contaminants or substance and take all steps reasonably necessary to protect employees and the public. City and Contractor, in conjunction with any appropriate regulatory entity, shall arrange for proper excavation, confinement, disposal or other handling of the contaminant or substance.

D. During all phases of the work, protect work sites, storage, and disposal areas from washout and erosion, and take precautions to control or abate dust nuisance and air pollution by cleaning up, sweeping, sprinkling, covering, enclosing, or sheltering work areas and stockpiles, and by promptly removing from paved streets earth or other material which may become airborne or may be washed into waterways or drainage systems.

107.14 Noise

Conform and comply with applicable noise regulations as established in *GRC, Article 7.20*.

107.15 Access to The Work

A. Provide access to the work for representatives of the City, the State of Oregon, the Federal Government, and other entities having jurisdiction in the area.

B. Allow access to the Project Manager, Engineer, and Inspector and their representatives to all parts of the work at all times and coordinate access to plants of manufacturers. Furnish them with every reasonable facility for ascertaining if the work meets requirements and intent of the Contract Documents

C. It shall be the duty of the Contractor to cause the work to remain accessible and exposed for inspection purposes. The City shall not be liable for expense entailed in the removal or replacement of any material required to allow inspection.

107.16 Defective or Unauthorized Work

A. All work that does not conform to the requirements of the Contract Documents shall be considered as unacceptable.

B. Upon discovery, immediately remove unacceptable and defective work and replace by work and materials that conform to the Contract Documents. This provision shall have full effect regardless of the fact that the unacceptable work may have been done or the defective materials used with the full knowledge of the Inspector.

C. Work that cannot be inspected due to subsequent work may be deemed unacceptable and the subsequent work shall be removed at the Contractors expense if:

(1) The Inspector had directed that the subsequent work not be done until the original work was inspected, or

(2) The Inspector reasonably believes that the original work may be unacceptable.

D. If the subsequent work was done with the full knowledge of the Inspector and the Inspector did not direct that the subsequent work not be done until the original work was inspected, the City shall pay the cost of removal of the subsequent work if the original work is deemed to conform to the requirements of the Contract Documents.

107.17 Railroad Crossings or Right-Of-Way

Submit a schedule of proposed operations to the Project Manager whenever work involves the crossing of any railroad line or the encroachment on any railroad right-of-way, including MAX light rail lines. The schedule shall be approved by the appropriate railroad officials and the Project Manager before the work is started within such area. Pay for services of flag persons and/or watch persons furnished by the railroad company and provide and drive piling, set cribbing, build bridges or tunnels, install enclosing pipe, and do all other work required by the railroad company or necessary for safety or maintenance of railroad traffic, including working on weekends, holidays, and providing extra shifts. Furnish any bond or insurance required by the railroad company as a result of such intended operations and indemnify the City for any and all expenses incurred by the City, and assume any and all liability or claims thereof imposed on the City as a result of operations in railroad right-of-way area. Bear all costs resulting from interferences, obstructions, or liabilities set forth in this subsection, whether or not herein specifically mentioned.

108 Control of Materials

108.01 Preference for Use of Oregon Products *(Not applicable to privately financed public improvements)*

Preference may be given to materials produced or manufactured in Oregon, if price, fitness, availability, and quality are otherwise equal. These provisions do not apply to contracts on projects financed wholly or in part by federal funds.

108.02 Quality of Work

Materials, parts, products, and equipment that are to be incorporated into the work shall be new and shall conform to the Contract Documents.

108.03 Sampling and Testing

A. Tests of the work may be made by the City at any time during construction of the work or during the production, fabrication, or preparation and use of materials, parts, products and equipment.

B. The City reserves the right to require samples and to test materials, parts, products, and equipment for compliance with pertinent requirements irrespective of prior certification of the materials, parts, products, and equipment by the manufacturer.

C. When such tests of the work are necessary as determined by the Project Manager, such tests will be made by the City at the Contractor's expense unless otherwise specified. Provide such facilities and cooperate as required for collecting and forwarding samples and do not incorporate into the work until tests have been made and found acceptable to the Project Manager. In all cases furnish the required samples without charge and in ample time to permit testing prior to use. Provide safety measures and devices to protect those who take the samples.

D. In the absence of any reference in the specification, it shall be understood that construction materials shall meet the specifications and the requirements of the American Society for Testing and Materials (ASTM), the American Association of State Highway and Transportation Officials (AASHTO), or the Oregon Standard Specifications for Construction (ODOT), as directed by the Engineer. When there is no pertinent coverage under ASTM, AASHTO or ODOT, the material concerned shall meet specifications and the requirements of applicable Commercial Standards of the Commodity Standards Division of the U.S.

Department of Commerce. Lacking such coverage, materials shall meet requirements established by reputable industry for a high-quality product of the kind involved.

E. All testing shall be performed by the Engineer, a testing laboratory selected by the City, or as directed by the Engineer.

F. In the event that a Special Provision requires testing at the City's expense and the work fails, the Contractor shall bear all costs for all subsequent testing necessary to meet specified requirements.

108.04 PROOF OF COMPLIANCE

The Engineer, at his/her sole discretion, may, in lieu of any other required sampling and testing, accept from the Contractor two copies of the manufacturer's proof of compliance with respect to the product involved, under conditions set forth as follows:

A. Proof of compliance shall state that the named product conforms to the City's requirements and that representative samples thereof have been sampled and tested as specified.

B. Proof of compliance shall either be accompanied with a certified copy of test results or certify that such test results are on file with the manufacturer and will be furnished to the Engineer upon request.

C. Proof of compliance shall give the name and address of the manufacturer and the testing agency and the date of tests; and shall set forth the means of identification which will permit field determination of the product delivered to the project as being the product covered by the proof of compliance.

D. Neither the Contractor nor the City shall be responsible for any costs of proof of compliance or for any costs of the sampling and testing of products in connection therewith.

108.05 INSPECTION BY OTHERS

Inspection of work by persons other than duly designated representatives of the City will not constitute inspection by the City.

108.06 STORAGE AND PROTECTION OF ITEMS OF WORK

Store items to be incorporated into the work to assure the preservation of their quality and fitness for the work. Stored items, even though approved before storage, may be re-inspected and are subject to rejection prior to being incorporated into the work. Stored items shall be located so as to facilitate their prompt inspection.

108.07 TRADE NAMES, EQUALS, OR SUBSTITUTIONS

A. In order to establish a basis of quality, certain processes, types of machinery or equipment, or kinds of materials may be specified either by description of process or by designating a manufacturer by name and referring to a brand or product designation or by specifying a kind of material. Generally, it is not the intent of the specifications to exclude other processes, equipment, or materials of equal value, utility or merit.

B. Whenever a process is designated or a manufacturer's name, brand, or item designation is given or whenever a process or material covered by patent is designated or described with the words "or equal" or "or approved equal" following such name, designation, or description, submittals for other processes, types of machinery or equipment, or kinds of

materials may be submitted to the Engineer for evaluation. These clauses are not a warranty by the City, either expressed or implied, that an equal exists.

C. The Contractor may offer to furnish materials or equipment of equal or better quality and performance other than that specified as a substitute after the Contract is executed. If the offer necessitates changes to or coordination with any other portion of the work, the data submitted shall include drawings and details showing all such changes. The Contractor agrees to perform these changes as part of the substitution of material or equipment. Acceptance by the Engineer shall not relieve the Contractor from full responsibility for the efficiency, sufficiency, quality and performance of the substituted material or equipment in the same manner and degree as the material and equipment specified by name. For publicly financed public improvement projects, any cost differential associated with a substitution shall be reflected in the Contract Price and the Contract shall be appropriately modified by Change Order as approved by the Project Manager.

D. If the Contract Documents includes a list of equipment, materials or articles for which the Contractor must name the manufacturer at time of submission of the offer, no substitutions therefore will be permitted unless approved in writing at the sole discretion of the Engineer.

E. All materials or equipment, proposed to be of equal or better quality, offered by the Contractor for substituting shall be approved by the Engineer prior to incorporation into the project.

109 MEASUREMENT AND PAYMENT

(Not applicable to privately financed public improvements)

109.01 MEASUREMENT OF QUANTITIES *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Payments shall be based on measurements of completed work in accordance with the United States Standard Measures and as set forth in the specifications.

B. Volume of materials measured in the vehicles by which they are transported will require computing of the volume of the vehicles to the nearest 0.1 cubic yard for its approved capacity, and identification of the vehicle and its capacity. Pay quantities will be determined by vehicle measurement at point of delivery with no allowance for settlement of material during transit.

Loads shall be level and uniform. Payment will not be made for material in excess of the approved capacity of the vehicle and deductions will be made for loads below approved capacity.

C. Volume of concrete and masonry in structures will be measured according to neat lines as shown on the plans or as altered on order of the Engineer of Record.

D. Volume of earthwork, particularly excavation and embankment, will be computed by the average end area method or by other methods of equivalent accuracy.

E. Weight – When payment for materials other than bituminous cements is on a weight basis and unless otherwise set forth in the specification under which material is to be furnished, pay quantities will be determined by weighing material on weigh scales provided by the Contractor as set forth hereinafter. Such weighing is to be of material in the hauling vehicle as loaded for delivery. Determination of tare weights and weight of loaded vehicles will be to the nearest ten (10) pounds. Tare weights will be determined by weighing empty vehicles

at intervals of such frequency as the Engineer deems necessary to ensure accuracy of payload weights.

F. Scales – When the Contract Documents call for materials that are to be measured by weighing on scales, the Contractor shall provide suitable scales and transport materials to scales at no expense to the City. Before use of scales is commenced, and as frequently as the Engineer may deem necessary to ensure accuracy, have the scales examined by an official of the Oregon Department of Agricultural Measurement Standards Division, and bear all resulting costs. Maintain the scales in accurate condition at all times.

G. Furnish and locate scales so that the amount of hauling involved in the delivering of materials is no greater than if no weighing were required; if not, bear expense of whatever extra hauling is required. If hauling of materials is to be paid for as a separate pay item, the distance shall be via the most direct practicable route and no allowance will be made for any extra hauling required to reach the scales.

H. A representative of the City may be present at all times to witness the weighing and to check and compile records of scale weights.

109.02 SCOPE OF PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Quantities listed in the Schedule of Prices do not govern final payment. Payments to the Contractor will be made only for actual quantities of items performed in accordance with terms of the Contract and for items of work actually performed under change orders.

B. The City certifies that sufficient funds have been appropriated to make payments required by the Contract during the fiscal year the Contract was executed by the City. Payment for work performed after June 30 of any given year is subject to funds being appropriated by the Gresham City Council. If funds are not appropriated, the City may terminate the Contract for convenience by notice to the Contractor.

109.03 COMPENSATION FOR ALTERATION OF THE CONTRACT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Unless changes and alterations in the Plans, Specifications, or quantities, or details of construction materially change the character of the work to be performed or the unit price thereof, the Contractor shall accept as payment in full, so far as Bid Items are concerned, payment at the same unit prices as are provided under the Contract for the accepted quantities of work done. If the Contract is done on a lump sum basis, the adjustment for increases or decreases may be based, at the sole discretion of the Project Manager, on a theoretical unit price. The price will be determined by dividing the Contractor's applicable breakdown category price (as listed in the Unique Specifications or as set forth in the Bid) by the estimated quantities of all units of work within the applicable breakdown category.

B. No claim shall be made by the Contractor, and Contractor shall not be compensated, for any loss of anticipated profits because of any alterations or changes made pursuant to the provisions of **Subsections 105.04 and 109.04**, nor by reason of any variation between the approximate quantities and the quantities of work as done. Unless specifically authorized in **Subsection 109.04**, no allowance will be made for any increased expense, loss of expected reimbursement or loss of anticipated profits suffered or claimed by the Contractor resulting directly from such alterations or changes or resulting indirectly from unbalanced allocation of overhead expense among the Bid Items by the Contractor in its offer and subsequent loss of expected reimbursements therefore or from any other cause.

C. If either (1) the total cost of the work, using actual quantities and unit prices, or (2) the total quantity of any major Bid Item, using actual quantities, changes more than 25%, then that part of the increase or decrease exceeding 25 percent shall be adjusted as the parties agree. A major item is any Bid Item, except lump sum items, having an actual cost greater than 10% of the contract price. If the parties cannot agree, the Project Manager will determine the equitable adjustment of time, payment, or both. The basis of the equitable adjustment of time will be in accordance with **Subsection 106.07**. The basis of the equitable cost adjustment for decreases will take into account a redistribution of fixed costs. The basis of the equitable cost adjustment for increases will be by using one of the following methods:

(1) Unit prices

(2) Other means of establishing costs

(3) Force account

D. The Contractor shall obtain written consent of the surety or sureties if: (1) changed work increases the total cost by more than 25% of the original total contract price, or (2) the Project Manager requests such consent.

E. The City will not adjust for increases or decreases in quantities if the City has entered the quantity of an item in the Schedule of Prices only to provide a common basis for Bidders. The Contractor shall bear all costs that result from such increases or decreases.

109.04 PAYMENT FOR CHANGE ORDERS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Payment or credit for any alterations covered by a change order shall be determined by one or a combination of the methods set forth in 1, 2, 3, or 4 below.

B. Any request for quotations on alterations to the work shall not be considered authorization to proceed with the work prior to the issuance of a formal change order, nor shall such request justify any delay in existing work. Lump sum quotations for alterations to the work shall include substantiating documentation with an itemized breakdown of the Contractor and subcontractor costs, including labor, material, rentals, and approved services, overhead, and profit calculated as specified under method "3".

C. In methods "1" and "2", the Contractor's quotations for change orders shall be in writing and firm for a period of thirty (30) days. Any compensation paid in conjunction with the terms of a change order shall comprise total compensation due the Contractor for the work or alteration defined in the change order. By signing the change order, the Contractor acknowledges that the stipulated compensation includes payment for the work or alteration plus all payment for the interruption of schedules, extended overhead, delay, or any other impact claim or ripple effect, and by such signing specifically waives any reservation or claim for additional compensation or time in respect to the subject of the change order.

D. Payment Methods

(1) METHOD 1 – UNIT PRICES: If applicable, those unit prices stipulated in the offer, or unit prices negotiated and mutually acceptable to the Contractor and the Project Manager.

(2) METHOD 2 – LUMP SUM: A total sum for the work negotiated and mutually acceptable to the Contractor and the Project Manager.

(3) METHOD 3 – FORCE ACCOUNT WORK:

(a) The Contractor shall perform work on a force account basis upon written notice from the Project Manager. Payment will be made as set forth herein.

(b) The Contractor must maintain records in such a manner as to provide a clear distinction between direct cost of work performed on force account basis and costs of all other operations performed in connection with the Contract.

(c) Daily, furnish to the Project Manager signed reports itemizing materials used and setting forth the cost of labor and charges for equipment rental, delineating whether said equipment is Contractor or Subcontractor owned. Provide names, identifications, and classifications of workmen, the hourly rate of pay and hours worked, and the size, type and identification number of equipment and hours of equipment operation. Substantiate material charges by vendor's invoices, submit such invoices with the reports; or, if not available, submit with subsequent reports. In the event said vendor's invoices are not submitted within 45 days after completion of the force account work, the City reserves the right to establish the cost of such materials.

(d) The Project Manager will review the records and reports furnished by the Contractor, make any necessary adjustments, compile the costs of work paid for on a force account basis and issue a change order covering the work.

(e) When work is ordered to be paid for on a force account basis, such work will be paid for on the basis of cost, plus a negotiated percentage allowance, not to exceed the maximum set forth herein.

(f) Items of cost for which payment will be made and to which payment will be restricted, together with the maximum percentage allowance applicable to the respective items, are as follows:

Items of Cost for Which Payment Will Be Made	**Maximum Percentage Additional Allowance To Actual Costs**
Labor, while engaged directly on force account work	20
Materials and supplies used on force account work	15
Rental on equipment having a value in excess of $300	No allowance except as provided in (i) to (l) below

(g) Payment for labor used in the work will be computed at the rates actually paid by the Contractor, but not to exceed prevailing straight time rates established by the Oregon Bureau of Labor and Industries, plus allowable allowance set forth above. Time allowed shall be the number of hours worked directly on force account operations. The employer's cost for accident and unemployment compensation premiums, labor insurance cost, public liability and property damage insurance costs and fringe benefits will be included in the direct labor cost item before applying the additional allowance. Any overtime worked on force account operations will be compensated at the straight time rates unless previous approval was obtained from the Project Manager.

(h) Payment for materials and supplies used on force account work must be supported by paid invoices. The Contractor and subcontractors shall take advantage of all practicable discounts on bills for materials and supplies, and such discounts shall

be reflected on all bills and invoices submitted to the City for payment. Freight will be considered to be part of the cost of materials and supplies and will be paid for as materials and supplies. Materials and supplies will be paid for as agreed in writing prior to their production or use. If there is no price agreement, the Project Manager shall establish a reasonable price for such materials and supplies.

(i) For the use of the Contractor's equipment, the Contractor will be paid at the monthly rental rates and the hourly operating costs set forth in the current edition of the "Rental Rate Blue Book for Construction Equipment" and the "Rental Rate Blue Book for Older Construction Equipment" which are published by the Equipment Guidebook Company, 2800 W. Bayshore Road, Palo Alto, California 94303. Reference copies of the above publications are on file at the Oregon Department of Transportation and the area offices of the Associated General Contractors of America. While using the Blue Book to determine allowable rental rates for equipment, the hourly rate will be calculated by using the monthly rate as set forth in the book, divided by one hundred seventy-six (176) hours. The rental rates will be the total compensation for all costs including fuel, supplies, repairs, and renewals. No further allowance will be made for these items. For the use of equipment not listed in said documents, the rental rates shall be as agreed to in writing between the Contractor and the Project Manager prior to use of said unlisted equipment. If there is no prior agreement, the Project Manager shall establish a reasonable price for such equipment.

(j) Time allowed for the Contractor's equipment shall be only the number of hours that the equipment actually operated directly on force account work.

(k) Compensation on equipment not owned by the Contractor will not exceed the rates actually paid by the Contractor and must be supported with an invoice that represents an arm’s length transaction. The Contractor and the Project Manager will agree on the equipment to be used and the appropriate rental rates before using said equipment on force account work. If prior approval is not obtained, the Project Manager will establish the rates by either comparing the available equipment and using the applicable rate for the least expensive equipment that will accomplish the work or utilizing the applicable Blue Book rates as established above. Rental cost for equipment not owned by the Contractor will be established so as to minimize the cost to the City. The hourly rate will be used unless the accumulated cost using the hourly rate exceeds the accumulated cost using the daily rate. The daily rate will be used unless the accumulated cost using the daily rate exceeds the accumulated cost using the weekly rate. This system will be expanded to utilize monthly or yearly rates as appropriate. These rental rates will be considered total compensation for all costs, including move-in, move-out, fuel, supplies, repairs, and renewals. No further allowance will be made for these items without specific approval of the Project Manager before the work is commenced. Payment for rental on equipment not owned by the Contractor shall be at the rental costs so determined, plus a negotiated percentage not to exceed the allowance for materials and supplies.

(l) Individual pieces of equipment having a value of $350 or less will be considered to be tools or small equipment, and no rental will be allowed on such, unless not normally on work site and must be rented from others. Then (k) will apply.

(m) No standby charges will be considered as a compensable part of any force account work. When a piece of equipment and operators thereof are hired, rented, or furnished as a unit, (owner/operator), the additional percentage to be allowed shall

be five (5) percent and the Contractor shall not be entitled to twenty (20) percent on the time of operators of such equipment. Neither shall the Contractor be entitled to payment for contributions made under terms of the Worker's Compensation Act, Unemployment Compensation Act, or Social Security Act or any other benefits to cover the time of these operators.

(n) The percentage allowances made to the Contractor in accordance with terms outlined herein will be full reimbursement and compensation for all supervision, use of tools and small equipment, overhead expense, bond costs, record keeping expense, insurance premiums, profits, indirect costs, and all other items of cost not specifically designated herein as items for which payment is to be made, whether or not the services, costs, and other items involved are furnished or incurred by the Contractor or subcontractor.

(o) When work is performed on a force account basis by a subcontractor, the Contractor will be allowed a supplemental markup of 5% on amount charged by subcontractor, provided the City will pay no more than a reasonable amount for work performed by a subcontractor.

(4) METHOD 4 – PAYMENT DETERMINED BY THE PROJECT MANAGER:

In case no other basis can be agreed upon and the Project Manager has not directed the work to be paid for on a force account basis, then an allowance may be made, either for or against the Contractor, in such amount as the Project Manager may determine to be fair and equitable.

109.05 CLAIMS AND NOTICE *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. In any case where the Contractor claims that he/she is entitled to or will be entitled to additional compensation and/or additional Contract time, the Contractor shall notify the Project Manager, in writing, of its intention to make a claim within 5-days of the occurrence of the event giving rise to the claim. If the Contractor considers any interpretation or order by the Project Manager to require additional compensation or contract time, or is a breach of the Contract, the Contractor shall notify the Project Manager prior to beginning the work or conforming to the interpretation on which the claim is based.

B. The Contractor's written notification shall be a written statement describing (1) the event or the act of omission or commission by the City or its agent that allegedly caused damage to the Contractor, (2) the nature of the claimed damage, (3) the clauses of the Contract or general legal principles upon which the claim is based, and (4) the factual occurrences upon which the Contractor bases the claim. Submission of notice of claim as specified shall be mandatory, and failure to comply shall be a conclusive waiver to such claim for damages by the Contractor. Oral notice will not be sufficient nor will notice after the specified time period since it tends to hinder, if not prevent, the City's investigation of the pertinent facts. After said written notification (if the claim is not resolved or withdrawn in writing) and only upon written direction by the Project Manager, proceed without delay to perform the work pursuant to the decision of the Project Manager. While the work on an unresolved claim is being performed, the Contractor shall keep track of costs and maintain records in the manner set forth in **Subsection 109.04(D)(3)** Force Account Work, at no cost to the City. Such notice by the Contractor and the fact that the Contractor and the Project Manager are keeping track of costs and maintaining records as required by **Subsection 109.04(D)(3)** Force Account Work shall not in any way be construed as proving the validity of the claim or the costs thereof.

C. A fully documented claims package shall be submitted in writing to the Project Manager within forty-five (45) days after completion of the work or the occurrence of the event upon which the claim is based. Each claim submitted shall include substantiating documentation with an itemized breakdown of the Contractor's and subcontractor's costs on a daily basis that shall include, but not be limited to, labor, material, equipment, supplies, services, overhead, and profit. All documentation that the Contractor believes is relevant to the claim shall be provided in said claim package including without limitation payroll records, purchase orders, quotations, invoices, estimates, profit and loss statements, daily logs, ledgers, and journals. The Project Manager may request from the Contractor additional documentation relating to the claim at any time during the Project Manager's investigation of the claim. Failure to submit the claim package in full compliance with this requirement, and/or maintain cost records as herein required, will constitute a waiver of the claim.

D. The requirements of this subsection shall apply to claims for additional or extra compensation or time arising from any situation that may occur except for claims of error in the final estimate as provided in **Subsection 109.08**.

E. Provided the claim or claims have been submitted in accordance with the requirements of this subsection, the Project Manager will, as soon as possible, consider and investigate the claim or claims of the Contractor for additional compensation. The Project Manager will promptly advise the Contractor of the decision to accept or reject the claim or claims, in full or in part. The Contractor shall proceed diligently with the work that is the subject of the claim and is not justified or allowed to cease or slow work without prior written approval from the Project Manager.

F. The Contractor shall commence any suit or action to collect or enforce any claim filed in accordance with this subsection within a period of one year following the mailing of the Project Manager's full or partial denial. If said suit is not commenced in said one-year period, the Contractor expressly waives any and all claims for additional compensation and any and all causes of suit for the enforcement thereof that the Contractor might have had.

109.06 THE CITY'S RIGHT TO ACCESS CONTRACTOR'S RECORDS *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. The City or its designated representative shall have access and a right (at any time) to inspect, audit, and copy the Contractor's books, records, documents, diaries, and logs and other evidence (hereinafter referred to as records) pertinent to performance and payment of the Contract and amendments, change orders, and any claims made in relation to the Contract. Contractor shall retain such records for a period not less than ten years from the date of contract execution.

B. The Contractor will make its records available within the boundaries of the City of Gresham, Oregon, or pay all additional costs for travel and per diem or other additional expenses incurred by the City in examining, auditing, inspecting, and copying the Contractor's records, by reason of said records not being available within said boundaries.

C. The Contractor agrees to the disclosure of all records and to their admission as evidence in any proceeding between the parties involving a claim or force account work.

D. In the event that the Contractor's records establish a discrepancy, favorable to the City, in the representations the Contractor has made to the City involving claims or force account work, the Contractor shall bear all costs incurred by the City in conducting the audit and inspection provided herein.

E. All costs referenced in subparagraphs “B” and “D” may be withheld and/or deducted from any amount due or that becomes due the Contractor.

F. If an audit is conducted, it shall be in accordance with generally accepted auditing standards. Contractor shall cooperate with any audit for a period of 10 years from contract execution.

109.07 PAYMENTS AND RETAINAGE *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. Payment for all work under the Contract will be made at the price or prices offered, and those prices shall include full compensation for all incidental work.

B. Contractor shall make progress estimates of work performed in any calendar month and submit to the Project Manager for approval, before the fifth of the following month, or as mutually agreed between the Contractor and the Project Manager. These estimates shall include value of labor performed and materials incorporated in the work since commencing work under the Contract. Such estimates need not be made by strict measurements and may be approximate only, and shall be based upon the whole amount of money that will become due according to terms of the Contract when the project has been completed.

(1) The Project Manager may include in payments 85% of the cost to the Contractor of materials or equipment not yet incorporated in the work but delivered and suitably stored at the site, or at some other location agreed upon in writing.

(2) Such a payment shall be conditioned upon submission by the Contractor of bills of sale or such other documentation satisfactory to the Attorney to establish the City's title to such materials or equipment or otherwise protect the City's interest including applicable insurance and transportation to the site, and a statement from the Contractor explaining why it is necessary to procure said equipment and/or materials.

(3) When such payments are made, the Contractor warrants and guarantees that the title to all materials and equipment covered by a progress payment, whether incorporated in the project or not, will pass to the City upon receipt of such payment by the Contractor, free and clear of all liens, claims, security interests, or encumbrances.

C. If the contract price is determined, in whole or in part, on a lump sum basis, Contractor shall prepare an itemized cost breakdown relating thereto and have the Project Manager approve it before commencing work; progress estimates based on said itemized cost breakdown may be the basis for progress payments. Upon direction by the Project Manager provide for revision of the costs breakdown to reflect the true costs of the work as it progresses.

D. If the contract price is determined wholly on a unit price basis, the Project Manager may use the unit prices in making progress estimates on the work. In case said unit prices do not, in the opinion of the Project Manager, truly represent actual relative costs of different parts of work, a percentage of the unit price may be used in making progress estimate adjustments.

E. If the Project Manager receives written notice of any unsettled claims for damage or other costs due to the Contractor's operations including, without limitation, claims from any City department or other governmental agency, an amount equal to the claim may be withheld from the progress payments, final payments, or retainage until such claim has been resolved to the satisfaction of the Project Manager.

F. If the Contract is for a public work and the contractor is required to file certified statements under *ORS 279C.845*, the City shall retain from the Contractor 25 percent of any amount earned until the certified statement is filed and shall pay the Contractor the amount retained within 14 days after the Contractor files the certified statements.

G. Progress payments will be made by the City on a monthly basis within thirty (30) days from receipt from the contractor of the Application and Certification of Payment or fifteen (15) days after the Application and Certification of Payment is approved by the Manager. Payment will be issued by the City for the amount of the approved estimate, less 5% retainage. Such amount of retainage shall be withheld and retained by the City until it is included in and paid to the Contractor as part of the final payment of the Contract Price. No progress payments shall be made until the City received a completed Contract Retention Preference form. A fee may be charged for some retainage options. The options include:

(1) The City will hold all retention in the City's bank account and will disburse the money directly to the Contractor upon final acceptance of the project.

(2) If the Contractor elects, retainage as accumulated will be deposited by the City in an interest-bearing account pursuant to *ORS 279C.560(4) and (5)*.

(3) For projects over $2,000,000, the Contractor may deposit a surety bond in an amount that will equal or exceed the anticipated total amount of retention. The bond is subject to approval by the City and Contractor must comply with *ORS 279C.560(6)* at all times. The bond must be submitted before any progress payments will be made on the contract. The bond will be released upon final acceptance of this contract.

(4) Securities in lieu of retainage will be accepted pursuant to *ORS 279C.560(3)*.

Upon substantial completion of the work under the Contract which shall be understood to be not less than 97.5% of the work, the Project Manager may, at his/her discretion, reduce the retained amount equivalent to not less than 200% of the balance of the contract price or the estimated value or estimated cost, whichever is greater, of the work remaining to be done.

H. The Project Manager may decline to approve an application for payment and may withhold such approval if, in the Project Manager's opinion, the work has not progressed to the point indicated by the Contractor's submittal. The Project Manager may also decline to approve an application for payment or may reduce said payment or, because of subsequently discovered evidence or subsequent inspections, the Project Manager may nullify the whole or any part of any payment previously made to such extents as may be necessary in their opinion to protect the City from loss because of: (1) defective work not remedied, (2) third party claims filed or failure of the Contractor to make payments properly to subcontractors for labor, materials, or equipment, unless surety consents to such payment, (3) reasonable doubt that the work can be completed for the unpaid balance of the contract price, (4) damage to another contractor's work, (5) reasonable indication that the work will not be completed within the contract time, (6) unsatisfactory prosecution of the work by the Contractor, (7) claims against the Contractor by the City, (8) failure to submit a construction schedule or failure to keep said construction schedule updated as set forth in **Subsection 106.01**, or (9) exceeding work limits as set forth in **Subsection 206.03**.

I. When any or all of the criteria set forth above have been remedied satisfactorily to the Project Manager, payment shall be made for amounts withheld because of them. Withholding of progress payments or partial payments under the criteria set forth above shall not entitle the Contractor to interest on such withheld payments or partial payments.

J. If the Contractor fails to complete the project within the time limit fixed in the Contract or any extension, no further estimate may be accepted or progress or other payments allowed until the project is completed, unless approved otherwise by the Manager.

K. Progress estimates are for the sole purpose of determining progress payments and are not to be relied on for any other purpose. The making of a progress payment shall not be construed as an acceptance of any of the work or materials under the Contract.

L. When the progress estimate indicates that the progress payment would be less than $1,000, no progress payment will be made for that estimate period, unless approved by the Project Manager.

109.08 COMPLETION, FINAL PAY ESTIMATE, AND FINAL PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

A. SUBSTANTIAL COMPLETION: The Contractor shall notify the Project Manager in writing when all or a portion of the work is considered substantially complete. If it appears to the Project Manager that the work is not substantially complete, the Project Manager shall not authorize an inspection. The Project Manager may provide a general list of major work components remaining before inspection will be authorized.

If it appears that the work is substantially complete, the Project Manager shall, within fifteen (15) days after receiving notice, authorize an inspection and determine if the work is substantially complete. If the work is not substantially complete, the Project Manager shall notify the Contractor of the work that must be performed prior to requesting another inspection.

If substantially complete, the Project Manager shall prepare a Certificate of Substantial Completion. The certificate will include a general list of items remaining to be completed. The date of substantial completion of all the work shall stop the accrual of liquidated damages, if applicable.

After acceptance of the Certificate of Substantial Completion by both parties, the City may elect to begin using the work. If the City so elects, the City shall be responsible for operation and maintenance of the work utilized. Contractor shall continue to be responsible for the warranty requirements of **Subsection 103.16**, protection of the work as required by **Subsection 107.08**, and all other applicable terms of the Contract.

B. FINAL COMPLETION: Notify the Project Manager in writing when work is 100% complete. If it appears to the Project Manager that the work is not 100% complete, the Project Manager shall not authorize a final inspection. The Project Manager may provide a general list of major work components remaining. If it appears that the work is 100% complete, the Project Manager shall, within fifteen (15) days after receiving notice, authorize a final inspection and either accept the work or notify the Contractor of work yet to be performed.

If the work is 100% complete, the Project Manager shall prepare a final pay estimate and Certificate of Compliance and Final Completion accepting the work as of a certain date. A Certificate of Compliance and Final Completion shall not be prepared until all provisions of the Contract have been met, including but not limited to, the submission by the Contractor of the Contractor Race/Gender Summary Sheet. The Contractor shall execute and return the final pay estimate and Certificate of Compliance and Final Completion within five (5) working days of receipt. Unless otherwise provided as a Special Provision, when the Manager accepts the Certificate of Compliance and Final Completion, the date the Contractor signs the Certificate of Compliance and Final Completion shall be the date the City accepts ownership of the work and the start date of the two (2) year warranty period.

The Project Manager shall include in the final pay estimate an addition to the contract price for any contract incentive or a deduction from the contract price for any liquidated damages and a deduction from the contract price in a fair and equitable amount for any damages to the City or for any costs incurred or likely to be incurred by the City due to the Contractor's failure to meet any plan or specification other than timely completion.

C. If the Contractor believes the quantities and amounts specified in the final pay estimate prepared by the Project Manager to be incorrect, the Contractor shall submit to the Project Manager within five (5) working days of receipt of the Project Manager's final pay estimate, an itemized statement of any and all claims for additional compensation under the Contract which are based on differences in measurements or errors of computation. Any such claim not so submitted and supported by an itemized statement within said period is expressly waived and the City shall not be obligated to pay the same. Nothing contained herein shall limit the requirements of **Subsection 109.05**.

D. The Contractor shall commence any suit or action to collect or enforce the claim or claims for any additional compensation arising from errors of computation in the final estimate within a period of one (1) year following the original mailing of the Project Manager's final estimate and Certificate of Compliance and Final Completion to the Contractor's last known address as shown in the records of the Project Manager. The Project Manager's issuance of a revised final estimate pursuant to this subsection does not alter the original final estimate date. If said suit, action, or proceeding is not commenced in said one (1) year period, the final estimate and Certificate of Compliance and Final Completion or revised final estimate and Certificate of Compliance and Final Completion, if revisions are made, shall be conclusive with respect to the amount earned by the Contractor, and the Contractor expressly waives any and all claims for compensation and any and all causes of suit or action for the enforcement thereof that the Contractor might have had.

E. Upon return of the fully executed Certificate of Compliance and Final Completion from the Contractor, the Project Manager will submit the Certificate of Compliance and Final Completion and final estimate to the Manager for approval. Upon approval and acceptance by the Manager, the Contractor will be paid a total payment equal to the amount due under the Contract including retainage within thirty (30) days in accordance with *ORS 279C.570.*

F. Monies earned by the Contractor are not due and payable until the procedures set forth in the Contract for inspection, approval, and acceptance of the work; for determination of the work done and the amount due therefore; for the preparation of the final estimate and Certificate of Compliance and Final Completion and processing the same for payment; for consideration of the Contractor's claim, or claims, if any; and for the preparing of a revised final estimate and Certificate of Compliance and Final Completion and processing same for payment all have been carried out.

G. As a prerequisite to final payment, if the Contractor is not domiciled in or registered to do business in the State of Oregon, the Contractor will provide the Project Manager with evidence that the requirement of *ORS 279A.120(3)* has been satisfied.

H. If the City declares a default of the Contract, and surety completes the Contract, all payments made after declaration of default and all retainage held by the City shall be paid to surety and not to the Contractor in accordance with the terms of the Contract.

I. Unless otherwise specifically noted and documented as required in **Subsection 109.05** or this subsection, acceptance by the Contractor of final payment shall release the City and the Engineer of Record from any and all claims by the Contractor whether known or unknown, arising out of and relating to the work. No payment, however, final or otherwise,

shall operate to release the Contractor or its sureties from warranties or other obligations required in the performance of the Contract.

J. The following provision survive the Certificate of Compliance and Final Completion of the Contract:

103.07 INSURANCE

103.16 TWO (2) YEAR WARRANTY

107.17 RAILROAD CROSSINGS OR RIGHT OF WAY

109.06 THE CITY'S RIGHT TO ACCESS CONTRACTOR'S RECORDS

END OF CHAPTER

CHAPTER 200 - GENERAL TECHNICAL REQUIREMENTS

201 EROSION PREVENTION AND SEDIMENT CONTROL

201.01 DESCRIPTION

This section covers, but is not limited to, construction entrances, sediment fences/barriers, temporary interceptor swales, temporary sediment basins, mulching, ground cover, and inlet protection for erosion and sediment control provisions.

201.02 MATERIALS

Provide all materials required in conformance with the *City of Gresham Erosion Prevention and Sediment Control Manual*, included in the *City of Gresham Stormwater Management Manual*.

201.03 CONSTRUCTION

Construction shall conform to the *City of Gresham Erosion Prevention and Sediment Control Manual*, included in the *City of Gresham Stormwater Management Manual*.

201.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

201.04.01 LUMP SUM BASIS

When shown in the Schedule of Prices, payment for erosion prevention and sediment control provisions will be made on a lump sum basis for all erosion and sediment control provisions within the limits specified.

201.04.02 INCIDENTAL BASIS

When not listed in the Schedule of Prices for separate payment, all erosion and sediment control provisions will be considered incidental work for which no separate payment will be made.

202 TRAFFIC CONTROL

202.01 DESCRIPTION

This Work consists of maintaining facilities to accommodate public traffic through and within the Project limits for the life of the Contract. Public traffic includes motor vehicles, bicycles, and pedestrians. The Work Area referred to in this section addresses the portion of the street closed to public traffic and set aside for workers, construction equipment, and construction materials. The work area is typically delineated by channelizing devices or separated from traffic using temporary barriers.

202.02 MATERIALS

202.02.01 UNIFORM TRAFFIC CONTROL DEVICES

Provide barricades, signs, and traffic control devices built in conformance with the Manual on Uniform Traffic Control Devices (MUTCD), current edition, published by the U.S. Department of Transportation, and the Oregon supplements to the Manual published by the Oregon Department of Transportation (ODOT).

202.03 CONSTRUCTION

202.03.01 GENERAL

The Contractor shall assign at least one appropriately trained and certified person on each project to have day-to-day responsibility for assuring that the traffic control elements are operating effectively and that any needed operational changes are brought to the attention of their supervisors.

- Conduct Work at all times so there is the least possible interference with or hazard to the traveling public and the affected community.
- Provide and maintain safe temporary access to business and residence driveways, temporary intersections, and temporary connections with roads, streets, and bicycle and pedestrian facilities.
- Use flag persons and provide and maintain such signs, barricades, warning lights, and other traffic control devices in conformance with the manuals referenced in **Subsection 202.02.01**. Provide approved protection and delineation between each work area and public traffic.

Patrol the construction area at least twice daily and reset all disturbed signs and traffic control devices immediately. Remove or cover non-applicable signs when not needed. Prior to closing or partial closing of any street, conform to **Subsection 107.04**.

The Contractor shall be responsible for damages to property, injury to persons, loss, expense, inconvenience, and delay caused by or resulting from any act, omission, or neglect of the Contractor, the Contractor's subcontractors and suppliers, or their employees while performing the work.

Road users should be guided in a clear and positive manner while approaching and within construction, maintenance, and utility work areas.

Do not stop or hold vehicles, block driveways, intersections, or connections for more than 15-minutes unless otherwise authorized. Allow emergency vehicles immediate passage.

Provide and maintain, in a safe and functional condition, temporary access to business and residence driveways, temporary intersections, and temporary connections with roads, streets, bikeways, sidewalks and footpaths.

While working on subgrade and other construction, provide adequate access to businesses, residences, intersections, and connections by maintaining existing gravel connections with well graded aggregate ramps and existing asphalt and concrete connections with temporary cold or hot mix asphalt ramps. Dispose of the temporary material in a manner satisfactory to the City.

Provide approved access to private properties at all times, except during stages of construction when it is impractical to perform construction and maintain access to private property simultaneously, as determined by the Engineer. When access is to be denied, notify occupants of affected properties at least 24-hours in advance.

If approved, Anti-Skid steel road plates are allowed for a maximum of 5-days per opening and must meet the following requirements.

Plate Thickness and Span – The following table lists the minimum plate thickness and maximum trench span for an AASHTO HS20-44 load configuration. Trench walls must be stable, and plates must extend beyond the excavation a minimum of 2-feet on each side.

Plate Thickness (Minimum)	Trench Span (Maximum)
3/4-inch	2-feet 6-inches
7/8-inch	3-feet 4-inches
1-inch	4-feet 5-inches
1 1/4-inch	7-feet
1 1/2-inch	10-feet

If the span is greater than 10 feet, submit a stamped, engineered temporary plating plan for review. Multiple stacked plates are not allowed.

Plates shall be pinned securely and ramped on all sides with a trench plate securing device, to ensure a smooth transition from the road surface to the top of the plate surface and back to the road surface. Ramping slope shall not be less than 12 inches for every 1 inch in height (measured from the lowest point of the covered surface to top of plate) and can be accomplished by mechanical fastening or wedging asphalt.

Ramping may be accomplished with either approved bituminous asphalt or, a mechanical fastening trench plate securing system. When a mechanical fastening system is used it shall be installed per manufacturer's direction and continuously maintained around all outside edges of the trench plate(s) until removal of the plate(s). Ramp transition on all edges exposed to traffic.

Steel plates shall be removed after 5-days and will be replaced with hot mix asphalt. In all cases a smooth transition over the construction project will be required at all times. Advance "STEEL PLATE AHEAD" warning sign shall be placed when plates are within the traveled way. Contractor shall make permanent repairs to the asphalt surface within 5-days after underground work has been completed.

Keep the surface being used by bicycles free of all dirt, mud, gravel, and other harmful materials. These surfaces include bike paths, bike lanes, roadway shoulders, or the outside 6-feet of the roadway.

When, in the judgment of the Engineer, vehicular parking is a hazard to through traffic or to the work, furnish and place NO PARKING signs on any street that is directly involved in the construction work.

At the end of each working day, backfill pavement edge excavations along shoulders to the elevation of the existing pavement with base material.

Do not excavate along both edges of the pavement adjacent to traffic at the same time. Before excavating at the edge of the pavement on the opposite side of the roadway, complete the construction to existing pavement elevation on the side that was excavated first.

- Do not close any lanes or pedestrian facilities until the area is signed according to the Plans and the requirements of this section.
- Do not place work zone signs or sign supports that will block existing walkways or existing bikeways, except at the closure point of a walkway or bikeway.

202.03.02 Traffic Lane and Sidewalk Restriction Requirements

Obtain the Engineer's approval before closing any lanes or sidewalks and do not close any lane or sidewalk until the area is signed according to the plans and the requirements of this section.

In general, the existing lanes of traffic should be open and in operation through the project at all times.

One lane may be closed to traffic in the immediate work area but only during hours when work is actually performed and in accordance with an approved traffic control plan.

All lanes may be closed to traffic if such closure is determined to be in the public's interest. Submit proposed methods of street closure times in each instance to the Engineer for approval in ample time to allow the traveling public to be notified through the news media.

Do not perform work that would restrict or interrupt traffic movement on opposite sides of the traveled way at the same time unless explicitly approved by the Engineer.

More than one intersection cannot be closed concurrently without prior explicit approval by the Engineer.

For the safety and accessibility of bicyclists:

- Protect bicyclists and delineate temporary bicycle routes by placing bicycle channelizing devices (BCD), or other approved devices, between the temporary bicycle route and the work area, as shown or as directed. Keep BCD in place, except as required for actual Work, until the permanent bicycle facility is completed and reopened, or bicycle traffic is returned to its original facility.
- When Work blocks the use of a bicycle route, and a temporary bicycle route detour is not practicable, install "Bicycles ON ROADWAY" (CW11-1) signs in advance of the point where bicyclists must share a traffic lane with motor vehicle traffic. Locate the "Bicycles ON ROADWAY" signs as directed.
- Provide traversable surfaces for temporary bicycle routes free of dirt, mud, gravel or other materials that could cause a bicyclist to slip and fall.

Per *GRC 6.35.050(4)* requirements, do not close any traffic lane, sidewalk, or parking lane during the annual Holiday Construction Ban period, commencing at 6:00 p.m. on Friday preceding Thanksgiving and running until 8:00 a.m. on the first business day on the following New Year, without a written waiver from the Manager.

Do not close any traffic lanes Monday through Friday between 4:00 p.m. and 8:00 a.m. the following day unless otherwise explicitly approved by the Engineer on the traffic control plan. Lane closure hours may be more restrictive on major arterials if determined by the Engineer to be in the best interest of the traveling public.

In addition, do not close any traffic lanes between:

- 3:00 p.m. on Fridays and 12:00 midnight on Sundays
- 12:00 noon on the day preceding legal holidays or holiday weekends and 12:00 midnight on legal holidays or the last day of holiday weekends.

For the purposes of this section, legal holidays are as follows:

- New Year's Day on January 1
- Memorial Day on the last Monday in May
- Independence Day on July 4
- Labor Day on the first Monday of September
- Thanksgiving Day on the fourth Thursday in November

- Christmas Day on December 25

When a holiday falls on Sunday, the following Monday shall be recognized as a legal holiday. When a holiday falls on Saturday, the preceding Friday shall be recognized as a legal holiday.

202.03.03 Traffic Control Plans

Formulate and submit a traffic control plan and a work schedule to minimize the disruption of traffic. Plan shall be submitted at the pre-construction conference. If no conference is held, plan shall be submitted at least 5 working days in advance of beginning work or 15 working days in advance of beginning work if a street closure is involved. Obtain approval of plan and schedule from Engineer and any other governing authority before commencing work. Allow traffic to pass through the work with as little inconvenience and delay as possible.

The traffic control plan shall contain a complete signing plan for semi-permanent and portable signs, barricades, and other traffic control provisions to keep the signs or devices current with the construction activities and the illumination of all detours and obstructions during hours of darkness. The Contractor shall be responsible for furnishing, installing, and maintaining all traffic control devices. Maintain these devices at all times including non-working hours.

The following information must be included in all traffic control plans prior to submitting for approval:

A. State date and time of day that construction will take place.

B. Specify what kind of work is being performed.

C. Provide name and number of person who can be contacted at all hours in case of emergency.

Approval by the Engineer of a general submittal for traffic control that does not identify specific request(s) for variance to the standards, such as outside lane restrictions of normal hours, will be deemed a denial of those specific items.

It will be the Contractor's responsibility to ensure that all traffic control plans follow the guidelines as outlined in the MUTCD and/or the Oregon Temporary Traffic Control Handbook prepared by the Oregon Department of Transportation.

Contractor is required to notify and provide a copy of the traffic control plan to all emergency service providers, school bus services, US Postal Service, garbage haulers and TriMet (if lane closure is on a bus route) after the traffic control plan has been approved, and a minimum of 48-hours prior to scheduled construction.

If signal operations are affected, the Contractor shall notify City of Gresham Signals at (971) 413-5800 a minimum of 48 hours prior to scheduled construction.

The Contractor is required to have a copy of the approved Traffic Control Plan on site at all times.

Temporary Pedestrian Accessible Route (TPAR) Plan

For the safety and accessibility of pedestrians, the temporary pedestrian accessible route plan shall provide and maintain TPAR for pedestrian pathways impacted by construction or construction staging, and the following:

- TPAR shall meet the requirements of Part 6 of the MUTCD.

- For intersection work that impacts the accessibility of pedestrian routes through or around the work zone, limit impacts to one corner of an intersection at a time, unless otherwise shown on the plans.
- For all sidewalk or sidewalk ramp closures, install signs and other TCD as shown, and do the following:
    - Limit pedestrian detour lengths to three sides of a city block or 1,000 feet, whichever is less.
    - Close the sidewalk at a point where there is an alternate way to proceed and provide signing and other TCD directing pedestrians to an alternate pedestrian route.
    - Place closure signing at the closure point, as shown.
- For TPAR where the existing facilities do not meet the requirements of Part 6 of the MUTCD, provide additional TCM and pedestrian detour routes that, as nearly as is practicable, meet or exceed the level of accessibility of existing facility features.
- For TPAR where the existing facilities meet the requirements of Part 6 of the MUTCD:
    - Provide additional TCM and pedestrian detour routes with an approved, non-slip, 60-inch minimum wide surface.
    - Where a 60-inch minimum width along the entire alternate pedestrian route is not possible, provide a minimum 48-inch wide route with a 60-by-60 inch passing space every 200 feet along the route.
- Protect pedestrians and delineate the pedestrian detour route by placing PCD, or other approved devices, between the pedestrian detour route and the work area. Keep PCD in place, except as required for actual Work, until the permanent pedestrian facility is completed and reopened.
- Where the TPAR moves pedestrians vertically between a sidewalk curb and the roadway surface, and for other similar sudden changes in elevation, provide or construct a temporary sidewalk ramp.
- When Work briefly or intermittently blocks or restricts the use of a pedestrian route, and a temporary detour route is not practicable due to the short duration of the restriction, provide a temporary means of allowing pedestrian access through or around the work area. Means of providing temporary pedestrian accessibility may include, but are not limited to:
    - Temporarily suspending the Work and making the pathway passable.
    - Use of construction staff to guide pedestrians through or around the work area.
    - Keep existing pedestrian facilities open during non-work hours or continue to provide a TPAR.

202.03.04 Construction and Maintenance of Detours

Construct and maintain temporary detours for protection of the work and the safe passage of traffic around work area.

Conform to requirements in **Subsection 103.15** for detours.

202.03.05 Flagging Requirements

The Contractor shall provide and maintain such signs, barricades, and warning lights as are necessary to warn and protect the public at all times on highways, roads, or streets affected by work operations. In addition, the Contractor shall also provide all necessary flag persons and guards necessary to warn and protect the public. Each flagger on duty shall wear a hard-hat and vest that conform to ODOT and/or OSHA requirements and shall be equipped with a highly visible, reflectorized "Stop/Slow" hand sign conforming to current standards for daylight use and with illuminated stand area of high visibility for night use.

For work zones on low volume rural roads that require flaggers, a single flagger may be adequate if the flagger is visible to approaching traffic from all appropriate directions.

Qualifications for Flaggers

- Completed and passed an ODOT-approved work zone, traffic control course within the past three years.
- The mental and physical ability to provide timely, clear, and positive guidance.
- A sense of responsibility for safety of public and work crew.
- A neat appearance.
- A courteous but firm manner.

202.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

202.04.01 Lump Sum Basis

When listed in the Schedule of Prices as a separate pay item, payment for Temporary Traffic Control will be made on a lump sum basis.

202.04.02 Incidental Basis

When not listed in the Proposal for separate payment, all Temporary Traffic Control will be considered incidental work for which no separate payment will be made.

203 Mobilization

203.01 Description

This section covers, but is not limited to, work necessary to obtain all bonds, insurance, licenses, and permits; move in personnel and equipment; set up all offices, buildings, and facilities; provide all required light, power, and water; install project information signs if required; prepare for construction completion; demobilize, including removal of all facilities and clean up; and all other work to successfully complete the project that is not covered in other bid items.

203.02 Materials

Provide all materials required to accomplish the work as specified.

203.03 CONSTRUCTION

Set up construction facilities in a neat and orderly manner within designated or approved work areas. Provide for an acceptable material and equipment storage area. Supply all labor and equipment necessary to accomplish the work as specified. Conform to applicable requirements of **Section 107 and 202** including, but not limited to, required notifications, protection of surveying monuments and other markers, temporary traffic control, temporary utility connections, protection of property, water and air pollution, and noise.

203.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

203.04.01 LUMP SUM BASIS

When mobilization is listed as a separate pay item on the Schedule of Prices, it will be paid for on a lump sum basis. Normal retainage will be deducted from partial payments.

Partial payments for mobilization under the Contract will be made under the following schedule:

A. When 5% of the total original contract amount is earned from other bid items, 50% of the amount bid for mobilization, or 5% of the total original contract amount, whichever is the least, less normal retainage, will be paid.

B. When 10% of the total original contract amount is earned from other bid items, 100% of the amount bid for mobilization, or 10% of the total original contract amount, whichever is the least, less normal retainage, will be paid.

C. Upon completion of all work on the project, payment of any amount bid for mobilization in excess of 10% of the total original contract amount will be paid.

The above schedule of progress payments for mobilization shall not be construed to limit or preclude partial payments otherwise provided by the Contract.

203.04.02 INCIDENTAL BASIS

When not listed in the Proposal, all mobilization costs will be considered incidental work for which no separate payment will be made.

204 CLEARING AND GRUBBING

204.01 DESCRIPTION

This section covers work necessary to clear, remove, and dispose of all debris and vegetation such as stumps, trees, logs, roots, shrubs, vines, grass, and weeds within the designated limits, to preserve from injury or defacement such objects and vegetation as are designated to remain in place, and to perform final clean-up of the designated area.

Clearing is defined as cutting of trees, bushes, vines, and other vegetative growth at or above ground surface and removal from the site of all such cut or downed vegetation.

Grubbing shall consist of the elimination of wooden and vegetative matter occurring at or below ground surface including, but not limited to, stumps, trunks, roots, canes, stems, debris remaining from clearing work, and sticks having a diameter of one inch or more.

Review with the Project Manager the location, limits, and methods to be used prior to commencing work under this section.

For publicly financed improvements, removal of man-made structures including, but not limited to, concrete slabs, walls, vaults, footings, asphaltic surfaced areas, and graveled areas, shall be included in payment for excavation or excavation and backfill as provided in **Subsection 206.03**, and will not be included in clearing and grubbing.

As indicated in **Subsection 107.08**, owners of buildings fronting to the work shall have salvage rights to plants, trees, shrubs, fences, and other improvements in the right-of-way. Contractor shall notify adjacent property owners. Contractor does not assume ownership of clearing and grubbing items until after fulfilling the requirements of **Subsections 107.08 and 204.03.02**.

204.02 MATERIALS

Materials shall conform to requirements of **Section 205**.

204.03 CONSTRUCTION

204.03.01 GENERAL

No explosives shall be used without the expressly written permission of the Engineer.

The Contractor shall obtain the required permits as specified in **Subsection 107.08** and perform clearing work in conformance thereto.

Remove trees and plants as designated within the area of work and remove all sod, topsoil, and organic earth within designated areas.

Remove and stockpile as directed all topsoil that is free of roots, rocks, and other objectionable material and is determined by the Engineer to be suitable for future use. Take reasonable care to prevent topsoil from becoming mixed with subsoil.

For publicly financed improvements, provide imported topsoil per **Subsections 206.02.07,** at no expense to the City, when existing topsoil is not adequately segregated as determined by the Engineer.

204.03.02 TIMBER SALVAGE

204.03.02A TREES IN STREET RIGHT-OF-WAY

The adjacent property owner shall have the right to any trees felled in the right-of-way adjacent to owner's property. Contractor shall notify adjacent property owners by mail or door-hanger at least 48-hours prior to felling trees. Trees shall be stacked and decked on owner's property or removed from the construction site if the owner does not reserve the right of ownership. Prior to cutting a tree in the public right-of-way, all required permits, as outlined in the *Gresham Community Development Code* shall be acquired.

204.03.02B TREES ON CITY-OWNED PROPERTY

City reserves the right to merchant timber as designated in the Contract Documents and as marked at the project site by the Engineer. The Contractor shall cut, trim, and handle marked merchantable timber in such a manner as to ensure the best sale value to the City and dispose of resulting waste materials as hereinafter specified, and shall assume ownership, remove, and dispose of all other timber. Prior to cutting a tree on City property, all required permits, as outlined in the *Gresham Community Development Code* shall be acquired.

204.03.03 Protection of Existing Vegetation

Protect all trees, shrubbery, and other vegetation not designated for removal from damage caused by the work. Cut and remove trees and branches only where approved by the Engineer. When directed by the Engineer, remove branches other than those required to provide a balanced appearance of any tree. Contractor will provide adequate protection for trees, shrubbery, and other vegetation adjacent to the work area that are to remain, as indicated on the plans. No roots projecting into the excavation will be cut except in the presence of the Inspector. All roots authorized to be cut will be cut neatly with a sharp tool to avoid torn root endings. Remove branches only as directed by the Engineer and treat scars with approved tree sealant.

204.03.04 Protection of Migratory Birds

The removal of trees should be conducted in accordance with the Migratory Bird Treaty Act (MBTA) and outside of the peak bird nesting seasons (February 15 through September 15). If tree removal must be conducted during this time period, the Engineer will hire a qualified Biologist to conduct a survey for active bird nests within 3 days prior to commencement of any demolition or construction activities. Should an active nest be identified, restrictions will be placed on construction activities in the vicinity of any active nest observed until the nest is no longer active, as determined by a qualified Biologist. These restrictions may include a 300- to 500-foot buffer zone designated around a nest to allow construction to proceed while minimizing disturbance to the active nest. Once the nest is no longer active, construction can proceed within the buffer zone.

204.03.05 Clearing

The Contractor shall clear the area above the natural ground surface of all vegetation and objectionable materials in accordance with approved plans. Cut timber and timber growth so that no stump extends above ground surface more than 6-inches. Prune all limbs over paved streets to an elevation 14-feet above the pavement on arterial and collector streets, and 12-feet above the pavement on all other street functional classifications. Prune all limbs over sidewalks to an elevation 8-feet above the sidewalk. All such pruning shall be done in accordance with accepted arboricultural standards and shall be approved by the Project Manager.

204.03.06 Clearing Borrow and Waste Disposal Areas

The Contractor shall clear areas designated as borrow and waste disposal areas to designated limits and dispose of all waste as herein specified.

204.03.07 Grubbing and Stripping

The Contractor shall completely remove all stumps and roots within the limits of required excavations and fill areas. No stumps or portion thereof shall come within 3-feet of fill subgrades or slope surfaces. Use of explosives for stump removal shall conform to requirements of **Subsections 204.03.01 and 205.02.02**. Obtain any and all permits required for use of explosives from controlling jurisdiction.

On areas to be occupied by fills, remove all grass, roots, and embedded wood to a depth not less than 3-feet below subgrade or slope surface on which the fill is to be constructed.

On excavation areas, remove all roots and embedded wood to a depth not less than 1-foot below subgrade or slope surface through which excavation is required.

204.03.08 Disposal of Waste Material

The Contractor shall remove and dispose of all waste material or debris from the site and shall obtain all necessary permits for disposing of waste materials. Copies of such permits shall be provided to the Project Manager prior to disposal.

204.03.09 Backfilling and Clean-up

The Contractor shall fill all holes and depressions caused by clearing and grubbing with material acceptable to the Engineer and reshape area to drain properly and to conform to adjacent undisturbed topography.

The Contractor shall leave the work area in a clean and orderly condition, free from litter and debris.

204.03.10 Removal and Replacement of Signs, Mailboxes, Posts, etc.

The Contractor will be responsible for the removal and replacement of all signs, mailboxes, posts, etc., when not specifically designated otherwise by the Engineer. Contractor will contact property owner prior to removal and reinstallation of mailbox. Mailboxes in work area must be temporarily moved to allow clearing and excavation as well as easy access by mail carrier and residents. Upon completion of excavation, mailboxes shall be permanently replaced behind curb to postal service regulations.

204.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

204.04.01 Lump Sum Basis

When shown in the Schedule of Prices, payment for clearing and grubbing will be made on a lump sum basis for all clearing and grubbing within the limits specified.

204.04.02 Incidental Basis

When not listed in the Proposal for separate payment, all clearing and grubbing will be considered incidental work for which no separate payment will be made.

205 Materials - Types And Use

205.01 Description

This section covers certain types of materials and their use that are common to appropriate forms of construction contained throughout Chapters 300 through 600.

205.02 Materials

205.02.01 General

Unless specified otherwise in the Contract Documents, materials contained herein will be used in required work.

205.02.02 Explosives

Explosives must be fresh, stable materials manufactured to the standards of the “Institute of Makers of Explosives” and conform to applicable requirements of *ORS Chapters 476 and 480*.

205.02.03 WATER

Water used in all work must be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter, or other deleterious substances. Use water conforming to AASHTO T 26 for mixing and curing Portland Cement Concrete, mortar, or grout. Water of approved potable quality may be used without test.

205.02.04 AGGREGATES

205.02.04A GENERAL

Aggregates shall be subject to approval at the source or at the actual stockpile from which the aggregate is taken for incorporation in the work. During production of the aggregate, provide samples of each size for testing if requested by the Engineer. On the basis of testing, modify or adjust crushing and screening operations to bring each separate size of aggregate within gradings, proportions, and quantities as specified.

In all stages of production, transporting, and stockpiling, handle aggregates in such a manner as will prevent the segregation of materials and the intermingling of separate gradings or kinds of aggregates.

Grading of designated aggregate sizes shall conform to the requirements of appropriate types of work contained within applicable sections throughout these specifications.

The determination of sizes and grading of aggregate shall conform to AASHTO T 27 and AASHTO T 11.

Durability

The source material from which aggregate is produced shall meet the following qualifying test requirements:

Table 205.02.04A-1 TEST REQUIREMENTS

TEST	TEST METHOD	REQUIREMENTS
Degradation:		
Passing No. 20 Sieve	ODOT TM 208	30% Maximum
Sediment Height	ODOT TM 208	3” Maximum
Abrasion	AASHTO T 96	30% Maximum

Other sampling and testing of aggregate shall be in accordance with the following methods:

Table 205.02.04A-2 SAMPLING AND TESTING METHODS

Sampling	AASHTO T 2
Material Passing No. 200 Sieve	AASHTO T 11
Organic Impurities	AASHTO T 21
Sieve Analysis	AASHTO T 27
Soundness	AASHTO T 104
Friable Particles	AASHTO T 112
Lightweight Pieces	AASHTO T 113
Sand Equivalent	AASHTO T 176
Wood Particles	ODOT TM 225
Elongated Pieces	ODOT TM 229

205.02.04B COARSE AGGREGATES

Coarse aggregates shall be natural or crushed rock or gravel that is retained on a No. 4 sieve and is free from flat, elongated, soft, or disintegrated pieces, vegetable material, or other deleterious matter.

Use crushed rock for coarse aggregate in aggregate bases and all asphalt construction requiring coarse aggregate. Coarse aggregate in Portland Cement Concrete may also use natural gravel or other inert materials of similar characteristics or combinations thereof. Total deleterious matter shall not exceed 2% by weight.

Do not allow amount of deleterious substances to exceed the following amounts:

Table 205.02.04B-1 DELETERIOUS SUBSTANCE LIMITS – COURSE AGGREGATE	
Lightweight Pieces	0.25% (by weight)
Friable Particles	0.25% (by weight)
Material Passing No. 200 Sieve	1.00% (by weight)
Wood Particles	0.05% (by weight)

Use coarse aggregates having weighted percentages of loss that do not exceed 12% by weight when subjected to five alternations of the sodium sulfate soundness test (AASHTO T 104).

For Portland Cement Concrete: Coarse aggregate must conform to the specified maximum size, and when each maximum size is separated into designated sizes, the separated designated sizes shall be as follows:

Table 205.02.04B-2 MAXIMUM SIZE – COURSE AGGREGATE	
MAXIMUM SIZE OF AGGREGATES	**SEPARATED SIZES**
2”	(2" – 1"), (1" – No. 4)
1½”	(1½" – ¾"), (¾"– No. 4)
1”	(1" – No. 4)
¾”	(¾"– No. 4)

Do not allow oversized and undersized materials to exceed a combined 15% of any separated size, nor allow any pieces to have any dimension greater than twice the maximum square screen size for the specified grading.

Grading of each of the specified separated sizes of coarse aggregate shall conform to the following:

Table 205.02.04B-3 GRADING REQUIREMENTS – COARSE AGGREGATE – PORTLAND CEMENT CONCRETE				
SEPARATED SIZES – PERCENTAGES (by weight)				
Sieve Size Passing	**2” – 1”**	**1½” – ¾”**	**1” – No. 4**	**¾” – No. 4**
2½”	100			
2	90 – 100	100		
1½”	35 – 70	90 – 100	100	
1”	0 – 15	30 – 65	90 – 100	100
¾”		0 – 15	50 – 80	90 – 100
⅜”			15 – 40	20 – 50
No. 4			0 – 10	0 – 10

For extrusions use the gradation specified in **Subsection 607.02.02**.

When a tolerance range is set forth in the above grading requirements, it shall be understood that the midpoint of the tolerance range is the target value and the product shall conform as closely as realistically possible to this target value. The purpose of the tolerance range is only to permit occasional minor variations from the target value that are, for practical reasons, unavoidable.

When coarse aggregate is to be separated into two sizes, as set forth hereinabove, control grading of material in each separated size within the applicable range of percentages given in grading requirements for coarse aggregate hereinabove so that the quantity of each separated size measured into the batch shall be not less than 35% nor more than 65% of total quantity of coarse aggregate measured into the batch.

Fracture of Gravel

When crushed gravel is furnished, it shall have at least two mechanically fractured faces on not less than the following percentages (by weight) of the material as determined by ASTM D5821.

Table 205.02.04B-4 FRACTURE OF GRAVEL	
TYPE OF USE	**PERCENTAGES**
Asphalt Concrete Pavement	75
Asphalt Surface Treatment	95
Asphalt Treated Bases	75
Aggregate Bases	70
Aggregate Trench Backfill	70

205.02.04C FINE AGGREGATE

Use fine aggregate consisting of finely crushed rock or gravel, fine sand, and other finely divided natural and inert mineral matter, thoroughly washed, and free of clay, loam, shale, alkali, vegetable matter, and other deleterious matter. Do not mix fine aggregate from different geological sources, and do not store in the same pile nor use alternately in the same class of construction or mix.

Fine aggregate shall meet the fracture face specification in **Subsection 205.02.04B** and shall not have deleterious material content exceeding the following limits:

Table 205.02.04C-1 DELETERIOUS SUBSTANCE LIMITS – COURSE AGGREGATE	
Friable Particles	1% (by weight)
Lightweight Particles	1% (by weight)
Material Passing No. 200 Sieve	1% (by weight)

When this fine aggregate for Portland Cement Concrete is subject to five alternations of the sodium sulfate soundness test (AASHTO T 104), weighted percentage of loss must not exceed 10% by weight.

Asphaltic concrete and surface treatments shall contain fine aggregate having a weighted loss of not more than 15 mass percent when sodium sulfate is used or 20 mass percent when magnesium sulfate is used in five cycles of the soundness test. Total deleterious matter shall not exceed 2% by weight.

Use fine aggregates that meet the durability requirements for coarse aggregates contained hereinbefore, and that meet the following liquid limit and plasticity index requirements:

Table 205.02.04C-2 LIQUID LIMIT AND PLASTICITY INDEX		
QUALITY	**TEST METHOD**	**REQUIREMENT**
Liquid Limit	AASHTO T 89	NP or 33 Maximum*
Plasticity Index	AASHTO T 90	NP or 6 Maximum*

*When tested as specified, both the liquid limit and the plasticity index test results shall conform to the following:

Table 205.02.04C-3 LIQUID LIMIT AND PLASTICITY INDEX TEST RESULT REQUIREMENTS		
PERCENT OF MATERIAL PASSING NO. 40 SIEVE	**AASHTO T 89 LIQUID LIMIT (Maximum)**	**AASHTO T 90 PLASTICITY INDEX (Maximum)**
0.0 to 5.5, Inclusive	33	6
5.1 to 10.0, Inclusive	30	5
10.1 to 15.0, Inclusive	27	4
15.1 to 20.0, Inclusive	24	3
20.1 to 25.0, Inclusive	21	2
Over 25.0	21	0 or NP

For Portland Cement Concrete: Fine aggregate must be graded from coarse to fine within the following limits. All fine aggregate shall meet the requirements of ASTM C33.

Table 205.02.05C-4 GRADING REQUIREMENTS – FINE AGGREGATE – PORTLAND CEMENT CONCRETE	
SIEVE SIZE PASSING	**PERCENTAGES (by weight)**
3/8”	100
No. 4	90 – 100
No. 16	45 – 75
No. 30	25 – 55
No. 50	5 – 30
No. 100	0 – 8

For extrusions, use the gradation specified in **Subsection 607.02.02**.

Use fine aggregate that has a sand equivalent of not less than 68, and that develops in the mortar strength test taken at seven days, a compressive strength of at least 95% of mortar using Ottawa sand.

Sand for mortar shall conform to the requirements of AASHTO M 45; testing shall conform to ASTM C109 for mortar strength.

205.02.05 PORTLAND CEMENT

Furnish one or more of the following types as specified:

Table 205.02.05 PORTLAND CEMENT TYPES		
Type I	–	For general use when special properties of other type cements are not required
Type IA	–	Air-entraining cement for same uses as Type I, where air-entrainment is desired
Type II	–	For use when moderate sulfate resistance or moderate heat of hydration is desired
Type IIA	–	Air-entraining cement for same uses as Type II, where air-entrainment is desired
Type III	–	For use when high early strength is desired
Type IIIA	–	Air-entraining cement for same use as Type III, where air-entrainment is desired

Portland Cement shall conform to AASHTO M 85 for low alkali cement except as follows:

A. Total alkali content (sodium and potassium oxide calculated as Na20+0.658K20) shall not exceed 0.6%.

B. Types I, IA, III, or IIIA must contain a maximum of 10% tricalcium aluminate.

C. Time-of-setting tests shall be by either the Gillmore test or the Vicat test or both, as Engineer elects.

When not otherwise specified, use Type I. Contractor, at his option, may use Type III Portland Cement (high early strength) in lieu of Type I in the identical quantity specified for the latter.

Differing brands or types of cement, or the same brand or type of cement from different plants, shall not be mixed during use nor be used alternately. Cement may be sampled either at the plant or site of work at the option of the Engineer.

205.02.06 CEMENT MORTAR

Use either standard premixed mortar conforming to ASTM C387, or mortar proportioned with 1-part Portland Cement to 2-parts clean, well-graded sand which passes a ⅛-inch screen and which conforms to AASHTO M 45. Admixtures may be used, but do not exceed the following percentages of cement by weight: hydrated lime – 10%; diatomaceous earth or other inert materials – 5%. Testing shall conform to ASTM C109 for mortar strength.

205.02.07 CEMENT GROUT

205.02.07A TYPE "A" GROUT

Utilize grout that consists of 1-part Portland Cement, 3-parts clean and well-graded sand by volume. Use minimum amount of water to produce a thick, creamy consistency.

205.02.07B TYPE "B" GROUT

Where Type "B" grout is specified, use a mixture consisting of 1-part Portland Cement, 5-parts clean and well-graded sand, and 7-parts pea gravel, by volume. Use minimum amount of water to produce a thick, creamy consistency.

205.02.07C NON-SHRINK GROUT

Non-shrink grout shall be SikaGrout 212, Euco NS, Five-Star, or approved equal non-metallic, cementitious commercial grout exhibiting zero shrinkage per ASTM C827. Grout shall not be amended with cement or sand and shall not be reconditioned with water after initial mixing. Unused grout shall be discarded after 20-minutes and shall not be used.

Non-shrink grouts shall be placed or packed only with the use of an approved commercial concrete bonding agent applied to all cured concrete surfaces being grouted. The bonding agent shall be compatible with the brand of grout being used. Water as a substitute for commercial bonding agent for non-shrink grout will not be allowed.

205.02.08 EPOXY CEMENT

Epoxy cement shall be a two-compound epoxy resin adhesive conforming to requirements of AASHTO M 235.

205.02.09 PORTLAND CEMENT CONCRETE

Use concrete having a 28-day design strength of 3,300psi for curbs, sidewalks, and poured-in-place manholes and catch basins, and 5,000psi minimum for Portland Cement Concrete pavement and commercial driveways per AASHTO T 22 and T 23 with 1½-inch maximum size aggregate. Curbs used in commercial areas shall have a 28-day design strength of 5,000psi.

High-early strength concrete (Type III cement) shall be used when patching trenches in Portland Cement Concrete pavement.

Use Type II cement concrete for all sewer and water main construction and appurtenances thereto.

Portland Cement Concrete shall be sampled and tested in accordance with the following ASTM test methods:

A. Sampling fresh concrete ……. ASTM C172

B. Obtaining drilled cores …… ASTM C42

C. Molding and curing specimens ……ASTM C31

D. Compressive strength …….. ASTM C39

E. Flexural strength ……ASTM C78

F. Slump ……..ASTM C143

G. Air content …….. ASTM C173 or C231

H. Unit weight, yield ……... ASTM C138

I. Setting of mortar …… ASTM C191 or C266

205.02.09A ADMIXTURES

Air-Entraining Admixtures – Air-entraining admixtures shall conform to AASHTO M 154 (ASTM C260) using one or another of several tests as directed by the Engineer. Chloride content of admixture must not exceed 0.5% by weight.

Water-reducing, Retarding, and Accelerating Admixtures – Water-reducing, retarding, and accelerating admixtures shall conform to AASHTO M 194 (ASTM C494) using one

or more of several tests as Engineer may direct. Chloride content of admixture must not exceed 0.5% by weight.

205.02.09B STEEL REINFORCEMENT

Use steel deformed bars conforming to ASTM A615, Grade 40; except, longitudinal bars in continuously reinforced concrete pavement shall be Grade 60.

Ties and supports shall be of 16-gauge, black, soft-annealed wire and bar supports for the intended uses. Bar supports in beams and slabs exposed to view after stripping must be galvanized or plastic coated. Use concrete supports for reinforcing in concrete placed on grade. Galvanizing shall conform to ASTM A153 Class D. Plastic shall not chemically react with concrete, shall be impervious and have a minimum thickness of 3/32-inches at point of contact with form.

205.02.09C DOWELS

Utilize steel dowels that conform to ASTM A663 Grade 70. Where specified, dowels shall be epoxy coated in conformance with ASTM A775.

205.02.09D JOINT MATERIAL

Preformed Expansion Joint Fillers – Use preformed expansion joint fillers for concrete conforming to AASHTO M 153 or AASHTO M 213 except that those furnished under AASHTO M 213 shall be tested in conformance to ASTM D1751. Fillers conforming to AASHTO M 213, except the binder if other than bituminous material, may also be used provided that they otherwise meet these specifications and provided further that they have been demonstrated to be rot and vermin proof for a period of at least 5-years. Preformed elastomeric joint seals must conform to AASHTO M 220. Poured filler must conform to AASHTO M 173.

Flatwork Joints – For joints in Portland Cement Concrete pavement refer to **Subsection 208.03**. For curbs, gutters, driveways, sidewalks, and pathways, refer to **Subsection 607.03.07**.

Compound for Precast Manhole Section Joints – Preformed plastic gaskets conforming to the requirements of AASHTO M 198 or joints using confined O-ring with rubber gaskets conforming to ASTM C443 shall be used.

Water Stop – Water stop shall be either plastic or rubber as the Contractor may elect conforming to the following:

A. Plastic – Polyvinylchloride water stop shall be manufactured to the dimensions called for on the plans from virgin polyvinylchloride (PVC) compound. No reclaimed PVC will be allowed. The water stop shall have the following properties:

Table 205.05.09D-1 PLASTIC WATER STOP PROPERTIES

ASTM TEST METHOD	SPECIFICATION
Tensile, PSI	D412, 1800
Elongation, %	D412, 350
100% Modulus, PSI	D412, 760
Low Brittle Temperature	D746, 50º F
Cold Bend Test*	No Failures
*Samples maintained at minus 70º F for 2 hours then bent quickly around a ¼" mandrel to 180º	

The supplier shall furnish test samples of the material from which his water stop is to be manufactured. Samples shall be in sheet-form having a uniform thickness of

from 1/16 to 1/8 inch and having a total area of not less than 2 sq. ft. Each sample shall be comprised of pieces not smaller than 6 in. x 6 in.

B. Rubber – Rubber water stop shall be manufactured to the dimensions shown on the plans in such a manner that the finished product shall have an integral cross section which will be dense, homogeneous, and free from porosity and other imperfections. The water stop shall have the following properties:

Table 205.05.09D-2 RUBBER WATER STOP PROPERTIES		
Hardness	–	The shore A Durometer hardness shall be 60 to 70 when tested in accordance with ASTM D2240
Elongation	–	Minimum of 450%
Tensile Strength	–	Minimum of 3000 pounds per square inch
Water Absorption	–	Maximum of 55% by weight after immersion in water for 2 days at 158º F

Tensile Strength After Aging – The test specimen, after accelerated aging of 7-days at 158° F, shall retain not less than 80% of the original tensile strength. The tensile strength of the test specimen, after accelerated aging of 48-hours in oxygen at 158º F and tensile stress of 300 pounds per square inch, shall be not less than 80% of the original tensile strength.

Compression Set – After 22-hours at 158° F, shall be not more than 30% when tested in accordance with ASTM D395, Method B.

Specific Gravity – 1.17 ± 0.03.

Defects – Minor surface defects such as surface peel covering less than one square inch, surface cavities or bumps less than ¼-inch in longest lateral dimensions and less than 1/16- inch deep will be acceptable.

205.02.09E Curing Materials for Portland Cement Concrete

Conform to one or more of the following requirements for curing materials; choice of method to be used is dependent on weather and existing conditions:

A. White burlap – polyethylene sheets …….. AASHTO M 171

B. Waterproof paper…….. AASHTO M 171

C. White, pigmented liquid, membrane-forming compound** …… AASHTO M 148

D. White polyethylene film …… AASHTO M 171

E. Burlap cloth (Jute or Kenaf) ……AASHTO M 182

**Required for Portland Cement Concrete curbs, but do not use on bridges or box culverts.
Test in accordance with ODOT TM 721.

205.02.10 Asphalt Materials

205.02.10A General

Unless otherwise specified herein or in applicable subsections, types and grades of material shall conform to the edition of the Oregon Standard Specifications for Construction in effect on the date the Notice to Contractors is published.

The asphalt cement furnished under this specification shall be petroleum asphalt prepared by the refining of crude petroleum and, when necessary, by the addition of modifiers designed to provide the asphalt characteristics specified. It shall be homogeneous and free from water and it shall not have been distilled at a temperature high enough to injure by burning or high enough to produce flecks of carbonaceous matter. It shall meet the requirements of AASHTO M 320-10, Standard Specification for Performance Graded Asphalt Binder, at the time of use when tested according to the methods specified.

205.02.10B ASPHALTIC CEMENT

Use performance grade (PG) 70-22 asphalt that meets ODOT requirements.

205.02.10C TACK COAT

Tack coat shall consist of CSS-1, CSS-1h, CMS-2, CMS-2S, CMS-2h, CRS-1, CRS-2, HFRS-2, or HFMS-2 emulsified asphalts.

205.02.10D CRACK SEAL

Furnish hot poured joint filler conforming to the requirements of AASHTO M 324, Type II (ASTM D6690, Type II)

205.02.11 GEOTEXTILES

205.02.11A DESCRIPTION

Geotextiles will be accepted for use in various applications according to the provisions of this section.

205.02.11B DEFINITIONS

A. **GEOTEXTILE** – A fabric manufactured specifically for use in civil engineering applications. Fibers used in the manufacture of geotextiles consist of long chain synthetic polymers; at least 85% by weight of the long chain polymers are polyolefins, polyesters, or polyamides.

(1) DRAINAGE GEOTEXTILE – For installation in subsurface drains or other drainage locations.

(2) EMBANKMENT GEOTEXTILE – For installation within or under embankments for stabilization.

(3) RIPRAP GEOTEXTILE – For installation behind and beneath riprap, buttresses, inlays, shear keys, and erosion control applications.

(4) WALL GEOTEXTILE – For construction of retained earth walls.

(5) SUBGRADE GEOTEXTILE – For installation on subgrades and in other material separation applications.

(6) PAVEMENT OVERLAY GEOTEXTILE – For installation beneath an asphalt concrete overlay.

B. **MACHINE DIRECTION** – The long, or warp, direction of the geotextile. The cross-machine, or fill, direction is perpendicular to the machine direction.

C. **NON-WOVEN GEOTEXTILE** – A textile produced by bonding and/or interlocking of fibers by mechanical, heat, or chemical means.

D. **ROLL** – Unit of continuous geotextile without transverse seams as furnished by the manufacturer. Roll size may vary between manufacturers and types of geotextiles.

205.02.11C ACCEPTANCE REQUIREMENTS

Base the actual minimum average roll values furnished by the manufacturer on representative test results from the manufacturing plant that produced the rolls. The geotextile shall meet or exceed each of those specified minimum values. Clearly label all rolls that are part of the same production run certified as meeting all applicable requirements.

The geotextile shall:

A. Be composed of a polymeric yarn or fiber oriented into a stable network that retains its relative structure during handling, placement, and design service life.

B. Meet or exceed the properties outlined below in **Table 205.02.11C**, Geotextile Property Values.

C. Be free of any chemical treatment or coating that might significantly reduce permeability.

D. Have the selvage finished so the outer fibers are prevented from pulling away from the fabric.

E. Be free of defects or tears.

F. Be resistant to ambient temperatures, acid and alkaline conditions, micro-organisms and insects.

G. Be for the intended purpose and have dimensional stability.

(See table on the following page.)

Table 205.02.11C GEOTEXTILE PROPERTY VALUES ***Minimum Value***								
Geotextile Property ***Test Method***	**Drainage (1) Geotextile**		**Riprap (1) Geotextile**		**Subgrade Geotextile**	**Embankment Geotextile**	**Wall (1) Geotextile**	**Pavement (1) Overlay Geotextile**
	Type 1	**Type 2**	**Type 1**	**Type 2**				
Grab tensile strength minimum in each principal direction – *ASTM D4632*	80 lb	180 lb	200 lb	260 lb	180 lb	230 lb	---	80 lb
Grab elongation – *ASTM D4632*	15%	15%	15%	15%	---	---	---	50%
Burst strength, diaphragm method – *ASTM D3786 Mod.*	130psi	290psi	320psi	430psi	290psi	430psi	---	---
Puncture strength – *ASTM D4833 or ASTM D3787 Mod.*	35 lb	80 lb	80 lb	110 lb	80 lb	110 lb	---	---
Apparent opening size (AOS), U.S. std. sieve – *ASTM D4751*	No. 70 sieve or smaller opening	No. 70 sieve or smaller opening	No. 70 sieve or smaller opening	No. 70 sieve or smaller opening	No. 30 sieve or smaller opening	No. 30 sieve or smaller opening	(2)	---
Water permeability – *ASTM D4491*	0.1 cm/sec	0.1 cm/sec	0.1 cm/sec	0.1 cm/sec	0.005 cm/sec	0.005 cm/sec	(2)	---
Ultraviolet stability – *ASTM D4355 at 500 hours*	---	---	70% strength retained	70% strength retained	---	---	70% strength retained	---
Wide strip tensile strength – *ASTM D4595*	---	---	---	---	---	---	(2)	---
Asphalt retention – *ASTM D6140 (3)*	---	---	---	---	---	---	---	0.20 gal/sq yd
Melting point – *ASTM D276*	---	---	---	---	---	---	---	300º F

205.03 CONSTRUCTION

205.03.01 GEOTEXTILES

This work consists of furnishing and placing geotextiles in drains, under embankments, for embankment reinforcement, under riprap, buttresses, inlays, shear keys and erosion control applications, behind retaining structures, over roadbed subgrades, and beneath pavement overlays as shown on the plans and at other locations as directed by the Engineer.

Installation Requirements

Acquisition and Storage: Provide complete rolls of geotextile as furnished by the manufacturer and protect against damage and deterioration. Store all geotextile rolls in a dry place and off the ground at all times according to ASTM D4873. Cover all rolls and partial rolls with a dark protective covering when received. The geotextile will be rejected for use if the Engineer determines it has defects, deterioration, or has been damaged.

Placement:

A. **Surface Preparation** – Prepare the surface receiving the geotextile to a smooth condition free of obstructions, depressions and debris unless otherwise directed. Do not drag the geotextile on the ground or mishandle in any way.

   Loosely place the geotextile without wrinkles so placement of the overlying material will not tear the geotextile. Lap or sew the geotextile at the ends and sides of adjoining sheets as specified.

B. **On Slopes** – Place the geotextile with the machine direction oriented up-down the slope. Lap the upper sheets over the top of the lower sheets. When the geotextile is placed on a slope steeper than 6:1, securely anchor the laps to the ground surface with pins or stakes as necessary to prevent slippage and tearing of the geotextile. Start placement of fill material on the geotextile at the toe of the slope and proceed upwards.

C. **Where Exposed To Water** – When geotextiles are placed under water or in areas where water will flow, the geotextile may be placed with the machine direction parallel to the direction of water flow instead of the placement direction specified on slopes, if approved by the Engineer. Overlap sheets so the upstream sheet is placed over the top of the downstream sheet. Adequately secure the geotextile to prevent slippage. As the geotextile is placed under water, place the backfill material on it to the required thickness. Do not place geotextile more than 50-feet ahead of the specified cover material.

Overlaps: Minimum overlap requirements for geotextiles are:

Table 205.03.01 GEOTEXTILE OVERLAP

GEOTEXTILE APPLICATION	MINIMUM OVERLAP REQUIREMENT, INCHES
Drains	12
Embankment stabilization	24
Geotextile wall reinforcement	24
Pavement overlays	**
Riprap and rock buttresses	24
Roadbed subgrade stabilization	24
**Use sufficient overlap to ensure closure, but not more then 6-inches.	

If the Engineer determines the specified overlap is not sufficient, increase the overlap to provide adequate coverage or sew the geotextile together in the field.

Field Seams:

A. **General –** Obtain the Engineer's approval before field seaming and stitching. Sew field seams with polymeric thread consisting of polypropylene, polyester, or kevlar, and as resistant to deterioration as the geotextile being sewn. Use a color of thread that contrasts with the geotextile being sewn so the stitches are exposed for inspection when the geotextile is placed. Seams must achieve 90% of the product's tensile and grab strengths.

B. **Equipment** – Use field seam stitching equipment that provides an acceptable lock-type stitch as recommended by the geotextile manufacturer and approved by the Engineer.

C. **Seam Type –** Obtain the geotextile manufacturer's recommendation for the type of seam and stitch to be used. If the Contractor does not obtain and provide the foregoing technical information, use a "J" seam with at least 3 stitches per inch. The flat, or prayer, seam may be used for repair of damaged in-place geotextile.

Protection of Geotextile: Protect the geotextile at all times from ultraviolet (UV) rays, contamination by surface runoff, and construction activities.

Traffic or construction equipment will not be permitted directly on the geotextile except as authorized.

When placed for construction, cover the geotextile with specified cover material as soon as possible. Do not leave in uncovered condition for more than 5-days.

Place cover material on the geotextile in a manner that the geotextile is not torn, punctured, or shifted. Use a minimum 6-inches thick cover layer or twice the maximum aggregate size, whichever is thicker. End-dumping cover material directly on the geotextile will not be permitted.

Limit construction vehicles in size and weight so rutting in the initial layer above the geotextile is not more than 3-inches deep or half the layer thickness, whichever is lesser. Turning of vehicles on the first layer will not be permitted.

Repair of Geotextile: Repair or replace all torn, punctured, or contaminated geotextiles during construction at no cost to the City. Repair by placing a patch of the specified geotextile over the affected area. Overlap the existing geotextile with the patch. Where geotextile seams are required to be sewn, repair any damaged sheet by sewing unless otherwise indicated on the plans or special provisions or as directed.

205.03.01A DRAINAGE GEOTEXTILE

When used in trenches for drains, place the geotextile in the trench as shown on the plans to loosely conform to the shape of the trench with no wrinkles or folds.

205.03.01B EMBANKMENT GEOTEXTILE

Construct embankment stabilization according to details shown on the plans. Place the geotextile layers so the geotextile machine direction is transverse to the edge of the embankment Spread the geotextile so all slack and wrinkles are eliminated.

205.03.01C RIPRAP GEOTEXTILE

Place geotextile behind and beneath riprap, buttresses, inlays, shear keys, and erosion control applications according to the details shown. Demonstrate, to the satisfaction of the Engineer, that the combination of the rock-fill drop height and the thickness of any aggregate cushion, when specified or required, are adequate to not puncture or damage the geotextile when placing the riprap or stone embankment material. In addition, the following limits apply:

Table 205.03.01C MAXIMUM DROP HEIGHT (Feet)

SIZE OF ROCK MATERIAL	ONTO GEOTEXTILE	ONTO AN AGGREGATE CUSHION BLANKET
Greater than 200 lbs.	0	3
200 lbs. or less	3	3

After placing the riprap, backfill all voids in the riprap face so the geotextile is completely covered and not visible.

205.03.01D WALL GEOTEXTILE

A. **General** – Begin wall construction at the lowest portion of the excavation and place each layer horizontally as shown on the plans. Complete each layer in its entirety before the next layer is started. Seams will be allowed only at the wall face. Either overlap geotextile sheets perpendicular to the wall or sew seams parallel to the wall face. Stretch the geotextile in a perpendicular direction to the wall face to eliminate slack before backfilling.

B. **Forming the Wall** – Use a temporary form system at the wall face during construction. Use pegs, pins, or the manufacturer's recommended method as approved by the Engineer, in combination with the forming system, to hold the geotextile in place until the cover material is placed.

C. **Backfill for Wall Construction** – Compact the backfill for the wall within the limits shown on the plans or as directed by the Engineer of Record. Compact each layer to 95% of maximum density as determined in ASTM D1557. Maintain the water content to within ± 3% of the optimum moisture content. Sheepsfoot rollers and vibratory rollers or other rollers with protrusions will not be allowed within 3-feet of the wall face. Compact this area using approved light mechanical tampers, without damaging or distorting the wall facing or reinforcing layers.

205.03.01E SUBGRADE GEOTEXTILE

Subgrade geotextile shall be installed in accordance with **Subsection 608.03.02**.

205.03.01F PAVEMENT OVERLAY GEOTEXTILE

Pavement overlay geotextile shall be installed in accordance with **Subsection 608.03.03**.

205.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

205.04.01 GEOTEXTILES

Square Unit Basis (Measurements) – Each geotextile installation will be measured along the lines and grades of the installation to the nearest square yard of surface area actually covered according to the plans or as required, except for drainage and wall geotextile applications.

The number of square yards of drainage geotextile will be computed by multiplying the length of the trench where geotextile is used by the perimeter of the trench as determined from the neat lines shown. For drainage geotextile under riprap, refer to **Subsection 206.04.07**.

Geotextile walls will be measured to the nearest square foot of wall face computed by multiplying the length times the sloped height of the wall.

Square Unit Basis (Payment) – The accepted quantities for geotextiles will be paid for at the contract price per square yard. Payment for wall geotextile includes all backfilling costs and geotextile shown on the plans. Payment for pavement overlay geotextile includes preparation work, sealant, and geotextile. For drainage geotextile under riprap, refer to **Subsection 206.04.07**.

Payment will be payment in full for all equipment, tools, labor, and incidentals necessary to complete the work. No separate payment will be made for constructing laps, seams, joints, and patches unless the Engineer orders additional amounts over the minimum. For laps wider than the minimum or specified width, payment will be made for the added lap width at the contract unit prices.

If the Engineer orders geotextiles with properties more stringent than specified, price adjustment will be allowed only for the difference in material cost.

206 EXCAVATION, EMBANKMENT, BEDDING, AND BACKFILL

206.01 DESCRIPTION

206.01.01 GENERAL

This section covers work necessary for excavation, construction of embankment, foundation stabilization, pipe bedding, pipe zone backfill, trench backfill, and disposal of material required in construction of streets, wastewater systems, water systems, stormwater drainage systems, structures, and appurtenances thereto.

206.01.02 UNCLASSIFIED EXCAVATION

Unclassified excavation is defined as all excavation, regardless of type, nature, or condition of materials, encountered unless separately designated. The Contractor shall assume full responsibility to estimate the kind and extent of various materials to be encountered in order to accomplish the work.

206.01.03 ROCK EXCAVATION

Rock excavation is defined as the removal of all material that, by actual demonstration, cannot, in Engineer's judgment, be reasonably excavated with equipment comparable to types listed in **Table 206.01.03** and equipped with rippers or similar approved equipment and which is, in fact, systematically drilled and blasted or broken by power-operated tools designed for rock excavation. The Engineer may waive the demonstration if material encountered is well-defined rock. The term “rock excavation” shall be understood to indicate a method of removal and not a geological formation.

Table 206.01.03 EXCAVATION EQUIPMENT			
MANUFACTURER	**MODEL**	**MINIMUM NET HORSEPOWER**	**TYPE OF EXCAVATION**
Caterpillar	225	125	Trench
John Deere	690	125	Trench
Case	125B/980B	125	Trench
Caterpillar	D8	300	Grading & Structural

In trenches, boulders or pieces of concrete below grade larger than half cubic yard will be classified as rock if drilling and blasting or other approved methods are actually used for their removal from the trench. If material that would be classified as rock by the above definition is mechanically removed without blasting, breaking, or splitting, it will be considered unclassified excavation, or upon approval by the Engineer of Record if larger equipment is specifically brought in for the sole purpose of rock removal, as defined above, then such removal will be considered rock excavation.

206.01.04 Trench Excavation

Trench excavation is defined as removal of all material encountered in the trench to the depths and widths as shown and, unless otherwise classified by the Contract Documents, shall be considered unclassified or rock excavation.

206.01.05 Embankment

Embankment is defined as furnishing, placing, and compacting embankment materials to the depth and configuration as shown in the Contract Documents or as directed by the Engineer.

206.01.06 Foundation Stabilization

Foundation stabilization is defined as the removal of unsuitable material in the bottom of an excavation, as approved by the Engineer, and replacement with specified material for support of a roadbed, pipe, structure, or appurtenances thereto.

206.01.07 Pipe Zone

Pipe zone is defined as the full width of the trench from 6-inches below outside of the pipe barrel to a point 12-inches above the top outside surface of the pipe barrel.

206.01.08 Trench Backfill

Trench backfill is defined as furnishing, placing, and compacting backfill material in the trench between the top of the pipe zone and the bottom of the pavement base or ground surface. Trench backfill will be classified as either native or select backfill.

206.02 Materials

206.02.01 Embankment Materials

The Contractor shall provide native or imported embankment materials approved by the Engineer of earth, sand, crushed aggregate, bank-run or river-run gravel or combinations thereof, that can be compacted to the densities specified, free of peat, humus, muck, frozen ground, organic matter, or other materials detrimental to construction of firm, dense, and sound embankments. Maximum size of material shall be 6-inches in diameter unless otherwise approved by the Engineer.

206.02.02 FOUNDATION STABILIZATION

Use foundation stabilization consisting of gravel or crushed aggregate ranging in size from 6”– 0” to ¾”– 0” as specified and approved. Material shall be well graded from coarse to fine unless otherwise specified by the Engineer of Record, shall be free from organic material, and shall not have more than 5% by weight passing the #200 sieve.

206.02.03 PIPE ZONE MATERIAL

Use pipe zone material consisting of 3/4”– 0” crushed aggregate, or sand as required by the Contract Documents.

Pipe zone material shall be as specified in **Subsection 206.02.05A** for crushed aggregate and as specified in this section for sand.

Sand shall consist of fine granular material naturally produced by the disintegration of rock produced from crushed gravel or from river dredging. Sand must be reasonably free of organic material, mica, clay, and other deleterious substances.

The grading of sand shall conform to one of the following grading requirements as specified. Gradation and sizes shall be tested in conformance with AASHTO T 27 and T 11.

Table 206.02.03 GRADATION OF SAND

SIEVE SIZE	PERCENTAGE PASSING BY WEIGHT	
	COARSE SAND	FINE SAND
1”	100	100
⅜”	95 – 100	---
#4	80 – 100	90 – 100
#30	10 – 30	---
#100	---	2 – 10
#200	0 – 8	0 – 4
Sand Equivalent	50 Minimum	50 Minimum

Table ranges are inclusive of tolerances. Material must be able to stand on a minimum 60º angle from horizontal following compaction to specified density. For the purpose of this specification, specified density will be a minimum of 95% of relative density as determined by ASTM D1557 at optimum moisture.

206.02.04 NATIVE BACKFILL MATERIAL

Native backfill material use is limited to trench backfill where the trench is not beneath a roadway or a designated future roadway, and its use must be approved by the Engineer.

The Contractor shall use native material excavated from within limits of the project that can be compacted to the density specified, that is free from vegetation and other deleterious material, and that contains no frozen ground.

Maximum particle size shall not exceed 6-inches in diameter.

206.02.05 SELECT BACKFILL MATERIAL

The Contractor shall use imported granular material for backfill consisting of crushed aggregate or controlled low-strength material as specified.

206.02.05A CRUSHED AGGREGATE

Coarse and fine aggregates shall conform to requirements of **Section 205** and to additional requirements contained herein.

Crushed aggregates to be incorporated in the work shall have a sand equivalent of not less than 50 when tested in conformance with AASHTO T 176.

Crushed aggregate shall meet the requirements for Liquid Limit and Plasticity Index of **Subsection 205.02.04C**.

The crushed aggregates shall be uniformly graded from coarse to fine and shall conform to one of the following grading requirements as specified. Gradation and sizes shall be tested in conformance with AASHTO T 27 and T 11.

Table 206.02.05A SEPARATED SIZES

SIEVE SIZE	PERCENTAGES PASSING (BY WEIGHT)					
	2½" – 0	**2" – 0**	**1½" – 0**	**1" – 0**	**¾" – 0**	**¼" – 0**
3"	100					
2½"	95 – 100	100				
2"		95 – 100	100			
1½"			95 – 100	100		
1¼"	55 – 75					
1"		55 – 75		90 – 100	100	
¾"			55 – 75		90 – 100	
½"				55 – 75		100
⅜"					55 – 75	
¼"	*30 – 45	*30 – 45	*35 – 50	*40 – 55	*40 – 60	85 – 100
#10						0 – 15
#40						0 – 5

Table ranges are inclusive of tolerances.
*Of the fraction passing the ¼" sieve, 40% to 60% shall pass the #10 sieve.

206.02.05B CONTROLLED LOW-STRENGTH MATERIAL

Controlled Low-Strength Material (CLSM) shall be accepted in lieu of granular fill as a backfill material in any excavation. CLSM shall be a mixture of Portland Cement, fly ash, aggregates, water and admixtures proportioned to provide a non-segregating, free-flowing, and excavatable material that will result in a hardened, dense, non-settling fill. CLSM shall be required in all Multnomah County and ODOT rights-of-way where specified in each permit.

CLSM backfill will be required in the following cases: 1) Where mechanical equipment cannot adequately compact the backfill material; 2) as the top 4-feet of backfill where manholes are installed in existing paved streets; and 3) where it is deemed necessary by the Engineer.

Strength Requirements

Hand excavated, non-structural CLSM shall produce unconfined compressive 28-day strength of 100psi (tolerance +50psi, –20psi). CLSM that is to be hand excavated shall contain aggregate no larger than ⅜-inch aggregate and comprising no more than 40% of the total aggregate content.

Materials

Portland Cement shall meet the standards as set forth in ASTM C150, Type I or II Cement.

Fly ash shall meet the standards as set forth in ASTM C618, for Class F pozzolans. The fly ash shall not inhibit the entrainment of air.

Air entraining agent shall meet the standards as set forth in ASTM C260.

Aggregates need not meet the standards as set forth in ASTM C33. Any aggregates that will produce the desired performance characteristics of the CLSM considered, will be accepted for consideration, except as follows. The amount of material passing a #200 sieve shall not exceed 12%, and no plastic fines shall be present.

Proportioning

CLSM shall be a mixture of cement, Class F pozzolan, sand, sometimes coarse aggregate, air entraining agent, and water. It is usually batched by a ready mixed concrete plant and delivered to the job site by means of transit mixing trucks.

The actual mix proportions shall be determined by the producer of the CLSM to meet job site conditions, minimum or maximum strengths, and unit weight. Entrained air content shall be a minimum of 8.0%. The actual entrained air content shall be established for each particular job with the materials and aggregates to be used to meet the placing and unit weight requirements. Entrained air content may be as high as 20% for fluidity requirements.

The table below provides a guideline for CLSM mixes. The weights shown are only an estimate of the amount to be used per cubic yard of CLSM. Actual amounts may vary from those shown as approved by the Engineer or approved trial mix data or field test results for proper strength, workability, consistency and density.

Table 206.02.05B CONTROLLED LOW-STRENGTH MATERIAL

CLASS OF CONTROLLED LOW-STRENGTH MATERIAL	CLASS 100 HAND EXCAVATABLE
Maximum compressive strength, PSI allowable variation, PSI	100 (+50/–20)
Maximum gallons of mixing water per cubic yard	50
Lbs. of cement per cubic yard, approximate	30 to 50
Lbs. of fly ash per cubic yard, approximate	200
Lbs. of dry aggregate per cubic yard, approximate (assumed SP.G. 2.67)	3200

A. If air entraining or water reducing admixture is used for flowability, total water and aggregates may be adjusted for yield.

B. For publicly financed improvements, design with prior test results shall be submitted to the Engineer for acceptance prior to placement.

C. Weights may be adjusted for flowability and pumpability.

206.02.06 RIPRAP

Riprap shall consist of 2-inch or 4 – 2-inch open graded crushed rock conforming to **Subsection 205.02.04**, having at least two fractured faces on 90% of the material, and being free from organic material.

206.02.07 IMPORTED TOPSOIL

Unless specified otherwise, imported topsoil shall be used. Provide natural, fertile, friable topsoil, representative of local productive soil, and 90% free of clay lumps or other foreign matter larger than 2-inch diameter, not frozen or muddy, with pH 5.0 to 7.0, and not less than 3% humus as determined by loss on ignition of moisture-free samples dried at 100º C. Gravel portion (particles larger than 2 mm) shall not exceed 15% of total volume. Imported topsoil shall be free of quack grass, horsetail, and other noxious vegetation and their seeds. Should such regenerative material be present in the soil all resultant growth, both surface and root, shall be removed and replaced to original specifications at the Contractor's expense within 2-years of acceptance of the work.

206.02.08 NATIVE TOPSOIL

When specified, use topsoil from the site. Save, store, protect, and reuse approved native topsoil taken from the top 12-inches of the excavation. Ensure that topsoil is free from grass, overburden and roots, sticks, hard clay, and any stones that will pass a 1-inch square opening. Wherever native topsoil cannot be saved or is not satisfactory for reuse, use imported topsoil conforming to **Subsection 206.02.07**, but only with the approval of the Engineer.

206.02.09 STORMWATER FACILITY TOPSOIL

Topsoil for stormwater facilities shall conform to the requirements specified in the *City of Gresham Stormwater Management Manual*.

206.02.10 WATER

Use water that conforms to requirements of **Section 205**. Provide water at the Contractor's sole expense. Whenever City water is to be used, the Contractor shall obtain a meter issued by the City.

206.03 CONSTRUCTION

206.03.01 EXCAVATION

Excavate, remove, and dispose of all formations and materials, natural or man-made, irrespective of nature or conditions, encountered within limits hereinafter defined or as specified, necessary for construction of the project. Method of excavation used is optional. Overbreak shall be removed at the Contractor's expense. Use hand methods for excavation that cannot be accomplished without endangering existing or new structures or other facilities. Excavations shall also comply with requirements of **Subsection 204.03.07**.

Furnishing, installing, and removal of all shoring, sheeting, and bracing as required to support adjacent earth banks and structures, and for the safety of the public and of all personnel working in the excavation shall be the Contractor's responsibility and shall be considered incidental to the construction.

206.03.02 ROCK EXCAVATION AND EXPLOSIVES

206.03.02A DEPTH OF EXCAVATION

Excavate to the depths designated or as shown on the appropriate plan or standard drawing. Correct over-excavation with compacted material as directed at no additional expense to City. In trenches for sewers and water mains or conduits, remove all material necessary to provide a minimum clearance of 6-inches under the pipe and replace with bedding material in conformance with **Subsection 206.02.03**.

206.03.02B METHODS AND RECORDS REQUIRED

Before rock removal by systematic drilling and blasting, or other methods, will be permitted, notify Engineer who, with Contractor or its representative, will determine the amount of material to be removed as rock excavation and will record the information. Then drill, blast, or break with power-operated tools specially designed for rock excavation, and excavate the material.

206.03.02C USE OF EXPLOSIVES

Explosives shall be in accordance with **Subsection 205.02.02.** Obtain any and all permits required for use of explosives required by the City of Gresham, and other governing agencies. No explosives shall be used without the expressed written permission of the Engineer.

Use of explosives shall be avoided as far as practicable, and in no case shall tunnel-blasting methods be used. Such blasting as must be done shall be controlled in a manner that will avoid possible shattering or loosening of materials back of lines to which the excavations are to be made. All blasting shall be supervised and/or done by a state-certified powder person. Be responsible for any and all damages to property or injury to persons resulting from blasting, or accidental or premature explosions that may occur in connection with the use of explosives. Give adequate warning to all affected persons and adjacent property owners prior to blasting.

Where excavation in hard, solid rock is to be made to depths of 10-feet or more; blasting thereof shall be done by the presplitting or preshearing method unless other methods are approved by the Engineer.

206.03.02D TRENCH BLASTING

When blasting rock in trenches, cover area to be shot with blasting mats or other approved types of protective material that will prevent scattering of rock fragments outside of the excavation.

206.03.03 PRESERVATION OF EXISTING IMPROVEMENTS

Conduct operations in such a manner that existing streets, utilities, railroad tracks, structures, and other facilities which are to remain in place will not be damaged, as specified in **Section 107**. Furnish and install cribbing and shoring, or whatever means necessary to support material carrying existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.

Protect temporary facilities, until they are no longer required, and remove and dispose of temporary supports and other protective means when they are no longer required.

206.03.04 EXCAVATION OF EXISTING IMPROVEMENTS AND MISCELLANEOUS

Unless otherwise specifically provided for, excavation or excavation and backfill includes all excavating, removing, hauling, and depositing, including but not limited to, existing pavements, walks, driveways, surfaces, slabs, curbs, gutters, and similar cement concrete structures, bituminous materials, all rock or gravel road surfacing materials, abandoned sewers, pipes and conduits, logs, piling, footings, foundations, vaults, and chambers, when such materials are within the limits of excavation.

Remove remaining ends of abandoned pipes, or portions of other items partially removed under this work, that would be left exposed after final excavation, to a minimum of 1-foot below the finished grade or elevation. Plug or seal ends of abandoned pipes in backfill or embankment areas. Stormwater pipe shall be reconnected as directed by the Engineer.

For publicly financed improvements, payment for all work in this section and repair of any damage will be considered incidental to the work and included under bid items for Excavation, Excavation and Backfill, or other specified earthwork items.

206.03.05 Limits of Excavation

Excavate to the depths and widths designated, allowing for forms, shoring, working space, base material, and finish topsoil where required. Do not excavate deeper than elevation shown. Excavation carried below grade lines shown or established without approval shall be replaced with approved compacted material at the Contractor's expense. Over-excavation under footings shall be filled with concrete of a strength equal to that of the footing, and cuts below grade shall be corrected by similarly cutting adjoining areas and creating a smooth transition, all at the Contractor's expense. When the precise location of subsurface structures is unknown, locate such structures by hand excavation prior to utilizing mechanical excavation equipment.

206.03.06 Slope Grading

Make slopes free of all exposed roots, unstable rock, and loose stones exceeding 3-inches in any dimension. Shape tops of banks to circular curves with, in general, not less than a 6-foot radius, unless rock makes such work impractical. All surfaces shall be neatly and smoothly trimmed.

206.03.07 Foundation Stabilization

If, in the judgment of the Engineer of Record, having consulted with the Contractor, material in the bottom of an excavation is unsuitable for supporting foundations, piers, retaining walls, cribbing, sewers, pipes, or similar facilities, the Contractor shall over-excavate as necessary for successful construction of the facility and backfill to required grade with thoroughly compacted foundation stabilization material conforming to **Subsection 206.02.02**.

206.03.08 Disposal of Excess Material

Excavated materials not suitable or not required for backfill or embankment shall be deposited at predesignated sites specified, or sites supplied by the Contractor. A grading permit will be necessary within the City for any embankment exceeding 50 cubic yards before the Contractor places any excavated material from City projects on any property. The Contractor shall make all arrangements for disposal of excess material, obtain the necessary permits when not provided by the City at predesignated sites, and bear all cost or retain any profit incidental to such disposal.

206.03.09 Temporary Location of Excavated Materials

Place excavated material specified for embankment or backfills only, not excess material, within the construction easement, right-of-way, or specified working area. Pile in such a manner that it will cause a minimum of inconvenience to the public. Furnish the Engineer a copy of written approval from each property owner prior to stockpiling material on private property outside of easements. Conform to all federal, state, and local codes governing the safe loading of ground adjacent to trenches with excavated material.

Provide free access to all fire hydrants, water valves, and meters, and leave clearance to enable free flow of stormwater in all gutters, conduits, and natural watercourses.

206.03.10 Surface Removal and Replacement for Trenches

206.03.10A Removal and Replacement of Topsoil

When specified and where trenches within easements cross lawns, garden areas, pasture lands, cultivated fields, or other areas on which topsoil conditions exist, remove all topsoil to a depth of at least 12-inches for the full width of the trench to be excavated. Stockpile topsoil to

one side of the easement in an approved location and do not mix with remaining excavated material. Replace and compact removed topsoil in the top of backfilled trench to the depth removed.

Maintain finished grade of topsoil level with area adjacent to the trench until final acceptance by the Engineer. Repair damage to adjacent topsoil caused by work operations. Remove all rock, gravel, clay, and any other foreign materials from surface; re-grade and add topsoil as required.

In lieu of stockpiling topsoil, Imported Topsoil as defined in **Subsection 206.02.07** may be substituted and replaced to the actual depth removed at the Contractor's expense. If, in the opinion of the Engineer, the Contractor does not take precautions to protect the stockpiled topsoil from contamination by rocks, clay, excess water, etc., the Contractor will be required to import topsoil meeting the requirements of **Subsection 206.02.07** at Contractor's own expense.

For publicly financed improvements, payment for removing, stockpiling, and replacing topsoil in the trench is included in the Trench Excavation and Backfill bid item.

206.03.10B Removal of Pavement, Curbs, Driveways, and Sidewalks

Cut all asphalt pavement to full depth with a pavement saw or other suitable pavement cutter prior to excavation of trenches.

Saw Portland Cement Concrete pavement, curbs, and sidewalks to a minimum depth of 4-inches or half the concrete thickness, whichever is greater. Subsequent removal may be accomplished by using a jackhammer; but, if the Contractor damages the portion of the facility that is to remain, it shall be replaced to the nearest joint at no expense to the City. Full depth cut by pavement saw can be done at the option of the Contractor. Use of any machine utilizing a falling or swinging weight in the form of a "headache ball" will not be permitted.

No slurry, dust, or other material created by sawcutting will be allowed to enter the stormwater drainage system.

Width of cut shall be as shown on the plans or standard drawings. Remove all loose, undermined, or damaged pavement. Remove all pavement between the trench and curb, pavement edge, or construction joint whenever the cut is 3-feet or less from the curb, pavement edge, or construction joint. Joints shall not be located in wheel paths. Prior to paving, all loose, cracked, sunken, or otherwise damaged edges will be sawcut in continuous straight cuts. Straight-line sawcut lengths will not be less than 50-feet. Cut angles will not exceed 15º.

Pavement and concrete materials removed shall be hauled from the site and not used for trench backfill. Replacement of pavement, curb, and sidewalk shall conform to the requirements of **Section 210.**

206.03.11 Trench Excavation and Shoring

206.03.11A Maximum Length of Open Trench

Length of trench excavated in advance of the pipe laying shall be kept to a minimum, and in no case shall it exceed 200-feet unless otherwise authorized. The length of unrestored work area and total unfinished trench construction shall not exceed a length of 600-feet for main line pipe laying operation unless otherwise authorized. Trench construction will not be considered completed until all restoration is completed. If the unfinished trench or restoration exceeds 600-feet in length, the main line construction shall be suspended and shall not be resumed until authorized by the Engineer.

In no case will any trench be left unfinished or uncovered overnight or outside working hours.

For purposes of this subsection, trench shall be considered as unfinished until excavation, construction, backfilling, and resurfacing with temporary cold mix or the same material as the adjacent finished surface has been installed to finish grade, and cleanup operations have been completed. Cleanup of backfilled and construction area shall include resurfacing and cleaning of area so as to allow use of trench and adjacent construction area for normal use as required in **Section 211**.

Where paved shoulders adjacent to excavations are less than 4-feet wide, protect the traffic at the end of each working day by backfilling pavement edge excavations to the elevation of the existing pavement with permanent base material or with temporary wedge of aggregate as shown on the plans.

206.03.11B TRENCH WIDTH

The maximum trench width at the ground surface will be kept to a minimum necessary to install the pipe in a safe manner. Trenches shall be of sufficient width to allow for shoring and permit proper joining of pipe and compaction of the backfill material along the sides of the pipe. Minimum trench width of unshored trenches shall provide a clear working space of at least 6-inches on each side of the outside diameter of the pipe bell. Shoring requirements shall be independent of trench widths.

Trench width at the top of the pipe will be the pipe nominal diameter plus 18-inches, except where specifically shown on the drawings, or specified in the Special Provisions. The pipe will be centered in the trench online and grade at all times. When authorized by the Engineer, the Contractor may use pipe of greater strength or install a superior pipe bedding in lieu of maintaining the trench widths shown. If maximum width shown is exceeded by Contractor (without written authorization), the Contractor shall provide pipe of a higher strength designation, a higher class of bedding, or both, as approved by the Engineer, at no expense to the City.

Make the excavation for manholes and other structures wide enough to provide a minimum of 12-inches between sides of structure and sides of excavation.

Confine top width of trench to dedicated rights-of-way or construction easements. Special written agreements to extend width may be made by the Contractor with affected property owners, provided such agreements are approved by the Project Manager.

206.03.11C GRADE

Excavate trench to lines and grades shown or as established by the Engineer, with proper allowance for pipe thickness, pipe bedding, and foundation stabilization. The subgrade upon which bedding is to be placed shall be firm, undisturbed, and true to grade. If the trench is over-excavated without approval of the Engineer, restore to grade with thoroughly compacted foundation stabilization material or pipe bedding material at the Contractor's expense. Place material over full width of the trench in compacted layers to established grade with allowance for pipe bedding.

206.03.11D SHORING AND BRACING OF TRENCHES

Shore and brace trench when necessary to prevent caving and to protect adjacent structures, property, workers, and the public. Increase trench widths by the thickness of the shoring and maintain shoring until pipe has been placed and backfilled at the pipe zone. Remove shoring as backfilling is done, in a manner that will maintain compaction of the backfill material in the trench and will not damage the pipe or permit voids in the backfill. All sheeting, shoring, and bracing of trenches shall conform to the safety requirements of the federal, state, or local agency having jurisdiction. The most stringent of these requirements shall apply.

206.03.12 DEWATERING

Furnish, install, and operate all necessary machinery, appliances, and equipment to keep excavations free from water during construction. Remove and dispose of all water entering the trench excavation continuously during the time the trench is being prepared for the pipe laying, during the pipe laying, when concrete is being placed, and until the backfill has been completed. Dewater and dispose of water so as to prevent injury to public or private property, and to prevent nuisance or menace to the public. Drainage of trench water through the pipeline under construction is prohibited unless otherwise approved by the Engineer. At all times the Contractor shall have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage. The Contractor shall have competent workers for operation of the pumping equipment available at all times. Control surface runoff to prevent entry or collection of water in excavations.

Control ground water such that softening of the bottom of excavations or formation of "quick" conditions or "boils" during excavation shall be prevented. Design and operate dewatering systems so as to prevent removal of natural soils and so that ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

Before dewatering is started, submit to the Project Manager a statement of the method, installation, and details of the dewatering system proposed to be used. Open and cased sumps shall not be used as primary dewatering for excavations deeper than 3-feet below static water table.

Release ground water to its static level in such a manner as to maintain the undisturbed state of natural foundation soils. Prevent disturbance of compacted backfill and flotation or movement of structures, water mains, sewers, and other utilities.

All foundation, vault, and trench de-watering water that has similar characteristics to stormwater runoff at the site, shall be discharged into a controlled conveyance system prior to discharge to a sediment trap or sediment pond.

Clean, non-turbid de-watering water, such as well-point groundwater, can be discharged to the public system. These clean waters should not be routed through sediment traps or sediment ponds with stormwater.

Highly turbid or otherwise contaminated de-watering water, such as from construction equipment operation, clamshell digging, concrete pour, or work inside a cofferdam, shall be handled separately from stormwater at the site.

Other disposal options, depending on site constraints, may include: 1) sanitary sewer discharge with City Wastewater Services approval, 2) over-land infiltration, 3) filter fabric/media filtration, or 4) transport off-site in a vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute local or state waters.

For publicly financed improvements, dewatering shall be considered as incidental to, and all costs included in, the various contract pay items in the Schedule of Prices.

206.03.13 COMPACTION

Compaction shall be by mechanical methods only.

Compaction equipment shall be of suitable type and adequate to obtain the amount of compaction specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort. Compaction equipment for granular materials shall be vibratory plate or vibratory drum compactors.

Any settlement noted in backfill, embankment, or in structures built over the backfill or embankment within the 2-year warranty period, in accordance with the **CHAPTER 100 - GENERAL REQUIREMENTS**, will be considered to be caused by improper compaction methods and shall be corrected at the Contractor's expense. Structures damaged by settlement shall be restored to their original condition by the Contractor at the Contractor's expense.

206.03.14 EMBANKMENT

206.03.14A EMBANKMENT

Preparation of Embankment Foundations:

Prior to construction of embankments, excavate and dispose of unstable material or unsuitable foundation material. Limit excavation to lines, grades, and cross sections shown. Fill basements, trenches, and holes that occur within embankment limits with specified material. Compact natural ground underlying embankments to the depth of grubbing or a minimum of 12-inches to density specified for the embankment material to be placed. Embankment construction shall also comply with requirements of **Subsection 204.03.07**.

Embankment Construction:

Construct embankments to the lines and grades shown. Deposit material in layers thin enough to ensure compaction requirements are achieved throughout the entire lift and not exceeding 12- inches deep across the full width of the embankment. Place material in continuous horizontal layers. Compact each lift to the appropriate density as determined by ASTM D1557.

For structural foundation embankment, the maximum aggregate size shall not exceed 3-inches and shall be compacted to not less than a relative maximum density of 95% throughout the embankment. For all other embankments, the compacted materials within 3-feet of established subgrade elevation shall have a density in place of not less than 95% of relative maximum density, and below 3-feet shall have a density in place of not less than 90% of relative maximum density and will show no appreciable deflection or adverse reaction under the compacting equipment during compaction.

In the immediate vicinity of curbs, walks, driveways, inlets, manholes and similar structures, holes, and where embankment and fill materials cannot be reached by the normal compacting equipment, the Contractor shall compact to specified density by approved methods.

Where embankments are constructed predominantly of rock fragments, the Contractor shall place material in layers of the thickness as directed by the Engineer of Record, but not greater than 3-feet. Placing of individual rock fragments having dimensions greater than 3-feet may be permitted upon approval of the Engineer, provided they have no dimensions greater than 6-feet, that clearances between adjacent fragments provide adequate space for the placing and compacting of material in horizontal layers as specified, and that no part comes within 4-feet of subgrade. The Contractor shall distribute and manipulate rock so that the space between the larger pieces is filled with smaller material, forming a dense and compact mass.

The Contractor shall exercise caution to ensure that embankment construction and fill does not move, endanger, or overstress any structure. The Contractor shall place and compact embankments at the end of bridges prior to the time that work begins on the bridge. When placing material against an existing slope face, Contractor shall terrace and key each 4-foot of fill.

If the surface of the prepared foundation or the compacted surface of a preceding lift is too dry or smooth to bond properly with the next layer of material, moisten or scarify, or both, before the next layer of material is placed. Compact slopes of all embankments thoroughly, and true to line and grade.

Do not place embankment material when the material, foundation, or previously placed embankment material is frozen. Embankment material shall not be placed in final position until moisture in excess of optimum moisture has been removed. Water settling of embankments will not be permitted.

206.03.14B PIPELINE EMBANKMENT

Where pipelines are to be placed within an embankment, construct the embankment to its final specified elevation prior to trench excavation for the pipeline. Place pipe bedding and pipe zone materials in accordance with applicable portions of **Subsection 206.03.15**. Place trench backfill material as specified in **Subsection 206.03.16**.

206.03.15 PIPE OR CONDUIT BEDDING AND PIPE ZONE

Construct bedding in conformance with **Standard Detail 214, Trench and Backfill**.

Class A Pipe Zone Bedding consists of a pipe cradle of Portland Cement Concrete. Bottom of trench shall be fully compacted before placement of pipe or cradle. Place concrete in such a manner that no dirt or foreign material becomes mixed with the concrete. Allow concrete sufficient time to reach initial set before any additional backfill material is placed in the trench. Conform to applicable provisions for concrete encasement in **CHAPTER 300 (WASTEWATER)**.

Class B Pipe Zone Bedding consists of leveling the bottom of the trench or top of the foundation material and placing pipe bedding select material to the horizontal centerline (springline) of the pipe. Bedding select material shall be placed in at least two lifts. Place the first lift to provide the minimum depth of bedding select material before the pipe is installed. Spread smoothly to proper grade so that pipe is uniformly supported along the barrel. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. Bedding under pipe shall provide a firm, unyielding support along the entire pipe length. Place subsequent lifts of not more than 6-inch-thickness up to the horizontal centerline of the pipe. Bring lifts up together on both sides of the pipe and carefully work under pipe haunches. Bedding material shall be per **Standard Detail 214, Trench and Backfill** except for water lines wrapped with polyethylene encasement or coal-tar coated steel pipe, in which case sand shall be used within the entire pipe zone area.

Pipe zone bedding shall be considered to include full width of excavated trench from the bottom of the trench or top of the foundation stabilization material to the top of the bedding.

Particular attention must be given to the area from the invert to the horizontal centerline of the pipe or top of the bedding to ensure that firm support is obtained to prevent any lateral movement of the pipe during the final backfilling of the pipe zone.

When placing lifts for the remainder of the pipe zone, pipe zone material shall be placed carefully around the pipe in layers with a maximum thickness of 6-inches and shall be compacted per **Standard Detail 214, Trench and Backfill**. Prevent pipe from movement either horizontally or vertically during placement and compaction of pipe zone material.

206.03.16 TRENCH BACKFILL AND COMPACTION

206.03.16A GENERAL

The type of backfill to be used above the pipe zone is indicated on the plans. The right is reserved to modify the use, location, and quantities of the type of backfill during construction as the Engineer considers being in the best interest of the City.

When backfill is placed mechanically, push the backfill material onto the slope of the backfill previously placed and allow to slide down into the trench. Do not push backfill into the trench in such a way as to permit free fall of the material until at least 2-feet of cover is provided over the

top of the pipe. Under no circumstances allow sharp, heavy pieces of material to drop directly onto the pipe or the tamped material around the pipe.

Take reasonable precautions to prevent excavated material that is designated to be used for backfill from becoming wet and exceeding the critical moisture limits. If native material does become wet and exceeds the critical moisture limits due to the Contractor's operations, replace with imported granular material at the Contractor's expense.

206.03.16B CRUSHED AGGREGATE

Backfill the trench above the pipe zone with imported crushed rock backfill material. Compact the entire trench depth in suitable lifts not to exceed 4-feet in depth, loose measure, with mechanical vibrating compactors with sufficient compactive effort to meet the specified density. Determine the type of equipment, method of placing lifts, and the amount of compactive effort required to prevent subsequent settlement. Compaction with hydra-hammer equipment will not be approved.

The top 3-feet of select backfill shall be compacted to 95% of maximum dry density as determined by ASTM D1557.

In the zone below the top 3-feet of backfill compact to 90% of maximum dry density as determined by ASTM D1557.

Any subsequent settlement of the finished surface during the 2-year warranty period shall be considered to be a result of improper or insufficient compaction and shall be promptly repaired by the Contractor at the Contractor's expense.

206.03.16C NATIVE BACKFILL

Backfill the trench above the pipe zone with excavated trench material.

As shown on the construction drawings, leave the trench with the backfill material level with the existing ground for the entire width of the trench. Material will be compacted to a minimum of 90% maximum dry density as determined by ASTM D1557. Any deficiency of backfill material that becomes apparent after settlement and within the warranty period shall be corrected by re-grading and adding additional material, where required, by the Contractor at the Contractor’s expense. Remove rocks larger than 2-inches in any dimension from the upper 8-inches of the backfill.

206.03.16D CONTROLLED LOW-STRENGTH MATERIAL

Controlled Low-Strength Material (CLSM) shall be discharged from the mixer by any reasonable means into the area to be filled. The CLSM shall be brought uniformly to the elevation as shown in the Contract Documents. Trench sections to be filled with CLSM shall be contained at either end by bulkheads of earth fill.

CLSM can be used only after the pipe, conduit, service lateral, or fitting has been backfilled with crushed rock, as specified in **Subsection 206.02.03**, unless otherwise specified by the Engineer. Where CLSM is placed directly around waterline, polyethylene encasement is required around all waterline and fittings.

CLSM shall not be placed on frozen ground. Subgrade on which CLSM is placed shall be free of disturbed or softened material and water.

CLSM batching, mixing, and placing may be started if weather conditions are favorable, as when the air temperature is at least 34º F or more and rising. At the time of placement, CLSM

must have a temperature of at least 40º F. Mixing and placing shall stop when the air temperature is 38º F or less and falling. Each filling stage shall be as continuous an operation as practical.

Permanent pavement may be placed directly upon the CLSM as soon as it has sufficiently self-consolidated so that the surface will withstand the process of paving without displacement or disruption. If the placement of the CLSM is not completed early enough to allow for permanent paving to be completed the same day, the Contractor shall provide steel plates to span the trench and prevent traffic contact with the CLSM overnight or until permanent paving can be placed.

The Contractor shall provide test cylinders for laboratory testing by the City. Test cylinders shall be prepared in conformance with ASTM D4832. Unless otherwise directed by the Engineer, a set of test cylinders shall be prepared for each day CLSM is placed on the project. A set shall consist of two cylinders for testing at 7 days and two cylinders for testing at 28 days. The Engineer may permit other testing methods more suitable for low strength concrete.

206.03.16E COMPACTION TESTING

Sampling and testing of materials for determination of compliance with the specified compaction requirements may be taken at any location and time as the Engineer may determine. 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 lift of compacted backfill immediately before placing the next lift. All costs in connection with excavating test pits, providing and installing safety shoring as required to protect the testing person, and standby time during field density test shall be considered incidental to backfill and shall be included in unit price bid for the various items involved.

When compaction testing has been performed by the Engineer and the required density has not been obtained by the Contractor, the Contractor shall bear all costs for all subsequent retesting in the areas of non-compliance. All testing shall be performed by the testing laboratory of the Engineer. The Engineer shall keep an accurate account of the time spent for the testing laboratory to perform retesting. The Contractor shall be totally responsible for rescheduling compaction testing with the Engineer. Any and all costs for tests associated with delays due to retesting shall be the sole responsibility of the Contractor.

If required density has not been obtained, remove the backfill from the trench, replace with backfill, and re-compact as many times as it is necessary to obtain the required specified minimum densities.

206.03.16F TRENCH MAINTENANCE

In graveled areas, maintain surface of the backfilled trench level with the adjacent and existing grade, before and after the area is opened to traffic, with 1”– 0” crushed aggregate material. In paved areas, temporary hot or cold mix asphalt pavement shall be used until the final pavement replacement is completed. The temporary asphalt or steel plating shall be in place at the end of each workday. Place temporary hot or cold mix asphalt in conformance with **Section 210**.

Maintain backfilled trench surface between any two successive manholes until the following operations have been completed and accepted by the Engineer:

A. Service connections installed, backfilled, and compacted.

B. Construction of manholes and appurtenances.

C. Air testing.

D. Cleanup and restoration of all physical features, including concrete curbs, gutters, and driveways.

E. Utilities restored to their original condition or better.

F. All work required between the two manholes accomplished.

Maintain backfilled trench surface between any two successive valves until the following operations have been completed and accepted by the Engineer:

A. Service connections installed, backfilled, and compacted.

B. Valves, valve boxes, and hydrants installed.

C. Hydrostatic testing.

D. Flushing and disinfection.

E. Cleanup and restoration of all physical features, including concrete curbs, gutters, and driveways.

F. Utilities restored to their original condition or better.

G. All work required between the two valves accomplished.

Do not undertake final pavement replacement until all items outlined above have been completed and accepted, unless otherwise approved by the Engineer.

Maintenance of backfilled trenches is considered as incidental to this item of work and payment for such maintenance will be considered as included in payment for Excavation and Backfill.

206.03.17 TOPSOIL

For topsoil application, refer to **Subsections 209.03.03E and 601.03.02**.

206.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

206.04.01 UNCLASSIFIED EXCAVATION

All unclassified excavation will be measured on a cubic yard basis, or on a linear foot basis for trench excavation and backfill when so shown in the Schedule of Prices, all in original position prior to excavation. The quantity measured for payment will include only material excavated from within the limits defined herein. Any additional excavation outside of these limits, unless ordered in writing by the Engineer, shall be considered as having been made for Contractor's benefit and will be considered as incidental to the work. Excavation required for the volume displaced by new concrete curbs, driveway, sidewalks, steps, and pathways shall be considered incidental to the work and no payment will be made for removal of this material.

206.04.01A ROADBED AND SLOPE EXCAVATION

Pay quantities shall be computed to the neat lines of cross sections as staked or as otherwise specified.

206.04.01B TRENCH EXCAVATION AND BACKFILL

General

Length of all trenches will be measured horizontally along center of pipe or conduit from center-to-center of valves, fittings, couplings, manholes, structures, or end of pipe or conduit, whichever is applicable. Measurement through structures will be deducted if the Schedule of Prices carries a separate item of structure excavation applicable to the structures.

Measurement and payment for trench excavation and backfill shall include all work specified herein, or not specifically paid for in other pay items.

If a portion of the native material is approved as backfill material in areas requiring such, there may be a need for additional granular backfill to be imported. No additional payment will be made for the granular backfill. It will be considered incidental to the bid item for native backfill material.

Trench backfill above the pipe zone will either be native, crushed aggregate or CLSM for purposes of payment. Payment will be made based on the type of backfill actually installed.

The price per linear foot for trench excavation and backfill shall be considered full compensation for the removal, protection, and replacement if damaged or interfering portions of existing sanitary sewer lines, stormwater lines, waterlines, and other improvements; the plugging or removing of abandoned conduit and structures; the excavations of the trench; disposal of excess excavation; the control of ground and surface waters; the preparation of subgrade; backfilling the trench; removing, stockpiling, and replacing topsoil; and all other work necessary to install the pipe or conduit, complete in place.

Gravity Sanitary Sewer Lines and Stormwater Lines

When contained in the Schedule of Prices, trench excavation and backfill will be paid for on a linear foot basis for type and depth of backfill used, with depth being measured from original ground or paved surface to invert of the pipe. The price bid per linear foot shall include the excavation required to provide space for the pipe bedding and any excavation and backfill necessary to widen the trench for installation of manholes and appurtenances.

For sanitary sewer lines and stormwater lines, depth figures shown in the Schedule of Prices are inclusive to the nearest 0.1-foot; that is, a trench depth measured as 11.9-feet will be paid for at the unit price for excavation 10 to 12-feet deep. A trench depth measured as 12.0-feet will be paid for at the unit price for excavation 12 to 14-feet deep. Depths measured at less than 8-feet will be included in the base depth of range of 0 to 8-feet. Depth of trench will be measured at intervals of 50-feet along the centerline of the trench, and the ends. Depths will be interpolated between each 50-foot station or the ends if the line is less than 50-feet long.

Pressure Sanitary Sewer Lines, Water Lines, and Conduits

Payment for trench excavation and backfill will be made at the respective unit prices stated in the Schedule of Prices for the trench excavation, the type of backfill used, and all incidental work, including all extra excavation required to provide space for pipe bedding, and shall also include any incidental excavation and backfill necessary to widen the trench for installation of branch-line fittings and appurtenances.

For waterline installations, payment for trench excavation and backfill will be included within the "Installation of Pipe" bid item, **Subsection 501.04.01**.

206.04.02 Rock Excavation

206.04.02A Structural Rock Excavation

Rock excavation will be measured on a cubic-yard basis for the actual quantity removed within the limits of excavation as defined for unclassified excavation. Quantity for payment shall be the amount approved by the Engineer.

206.04.02B Roadbed and Slope Rock Excavation

Rock excavation will be measured on a cubic-yard basis for the actual quantity removed within the limits of excavation as defined for unclassified excavation. Quantity for payment shall be the amount approved by the Engineer.

206.04.02C Trench Rock Excavation

Rock excavation will be measured on a cubic-yard basis as follows:

Length

Length will be the entire horizontal distance where rock is encountered, measured on a lineal foot basis along the centerline of the trench.

Width

For sanitary sewer lines, stormwater lines, and water lines, the width for payment of trench rock excavation shall not exceed the inside pipe diameter plus 18-inches, except at manhole locations where the width will be the manhole diameter plus 2-feet where rock is encountered.

Depth

Measurement for depth will be the vertical distance from the top of the rock to the bottom of the rock or a depth that is 6-inches below the sanitary sewer line, stormwater line, water line, or structure, whichever is less. Depth will be measured at intervals of 25-feet for sanitary sewer lines and stormwater lines and 50-feet for water lines along the centerline of the trench, beginning at the first location that rock is encountered and ending where the rock stops. The average depth between measuring points will be the depth used for computing depth of rock.

Payment for rock excavation will be based on the unit price per cubic yard stated in the bid and will be paid in addition to the payment for trench excavation and backfill. Payment for rock excavation shall include full compensation for all work necessary to excavate the rock material. No payment will be made for rock excavated below the required grade or outside the widths mentioned above.

206.04.03 Hard Surface Removal and Replacement for Trenches

Measurement and payment for the removal and replacement of Portland Cement Concrete pavement, asphaltic concrete pavement and surfaces, curbs, driveways, and sidewalks shall conform to the provisions of **Section 210**.

Payment for removal will be covered under excavation unless specifically stated otherwise in this document.

206.04.04 Embankment

Measurement for payment for embankment compacted in place will be made on a cubic yard basis. Computation of volume for payment will be based on field measurement of the actual number of cubic yards constructed within limits shown or directed. Where applicable, this shall be within neat lines of the staked cross section.

No payment will be made for quantities required due to subsidence or settlement of ground or foundation, for settlement of materials within the embankment or for shrinkage, settlement, washout, slippage, or loss regardless of cause, subject to the provisions of **Subsection 107.03**.

Deduction may be made for piers, columns, pipes, or miscellaneous construction features constructed within embankment limits.

Payment shall constitute full compensation for all work and all materials used, whether obtained from the site of work or imported.

Trench excavation, bedding, and backfill placed in the compacted embankment will be paid for separately for the particular item and class of construction.

206.04.05 Foundation Stabilization

Payment for this item will be based on the unit price per cubic yard stated in the Schedule of Prices. Measurement will be based upon a trench pay width of the nominal pipe diameter plus 18-inches. Payment for this item shall constitute full compensation for all materials, labor, equipment, and incidentals necessary to furnish materials at the site and for placing and compacting it and for the extra depth of excavation required below the pipe base grade structure or roadway to provide for a stable base. This item is to provide for unstable base encountered in the progress of the work and shall be used only under the direction of the Engineer. Foundation stabilization will only be paid in those areas where the Engineer has given written direction for installation.

206.04.06 Pipe or Conduit Bedding and Pipe Zone

Payment for pipe bedding and pipe zone material will be included in the lineal foot payment for pipe as specified in **Subsection 301.04, Subsection 401.04 and/or Subsection 501.04**.

206.04.07 Riprap

Riprap material will be measured for payment on a cubic yard or ton basis only when listed in the Schedule of Prices as a separate bid item, or when directed by the Engineer. Measurement will be based upon individual trip tickets of actual truck measure furnished to the City for the cubic yards or tons used under this item. Trip tickets shall be presented to the City on the day the material is delivered. No payment will be allowed on trip tickets not so provided.

Payment for riprap shall include all work necessary to furnish and place the material complete, including any required geotextile. When not listed in the Schedule of Prices, payment for riprap shall be incidental to other items of work.

206.04.08 Imported Topsoil

Measurement and payment for the imported topsoil will be made on a cubic yard or ton basis and only when listed in the Schedule of Prices as a separate bid item. Measurement will be based upon individual trip tickets of actual truck measure furnished to the City for the cubic yards or tons used under this item. Trip tickets shall be presented to the City on the day the material is delivered. No payment will be allowed on trip tickets not so provided.

Payment for imported topsoil shall constitute full compensation for all work necessary to furnish materials onsite, placing material, and for full compaction in place.

206.04.09 Shoring

Shoring, including but not limited to bracing and cribbing, and including all work and materials expended in furnishing, placing, and removing such equipment necessary to complete the excavation, shall be considered incidental to the pay item for excavation.

206.04.10 Dewatering

Dewatering shall be considered as incidental to and included in the pay item for excavation.

207 Boring and Jacking

207.01 Description

207.01.01 Boring

Boring shall include all methods by which a pipe or conduit is pushed or pulled into place and by which the excavation method precludes the stationing of a worker within the pipe or conduit without stopping or removing the excavation equipment.

207.01.02 Jacking

Jacking shall include all methods by which a pipe or conduit is pushed or pulled into place and one or more workers inside the conduit excavate and assist in keeping the conduit on a straight and true grade and alignment.

207.01.03 Permits

Permitter shall designate the owner of railroad tracks or other facilities with prior rights under which a pipe or conduit must be bored or jacked.

All necessary permits for the undercrossing will be obtained by the City.

The operation across the permitter's right-of-way must conform to the requirements of the permitter as outlined in a pipeline crossing agreement made between the permitter and the City. The Contractor shall conform to all requirements of the pipeline crossing agreement. Before work is commenced, the Contractor shall be solely responsible for obtaining and delivering to the permitter a public liability and property damage insurance policy in the amount required in the pipeline crossing agreement. The insurance company writing the policy shall be authorized to do business in the State of Oregon and shall be satisfactory to the permitter. The insurance policy or policies shall be delivered to and remain in the possession of the permitter. If any special agreement is required between the Contractor and the permitter, it shall be completed and signed before the Contractor enters upon or commences work on the permitter's property.

207.02 Materials

207.02.01 Pipe Bedding and Pipe Zone Material

Conform to the requirements of **Section 206** unless otherwise specified in the Contract Documents.

207.02.02 Pipe

Conform to **Section 301, 401 or 501** for the strength, class, and type as shown unless otherwise specified in the Contract Documents.

207.02.03 Casing

Provide casing of size to permit proper construction to the required lines and grades. Casing shall be the type shown in the table below.

Use minimum gauge or wall thickness corresponding to the size of casing selected from the following; however, be responsible for selecting the gauge consistent with the operations and the specified requirements of the permitter.

Table 207.02.03 CASING	
DIAMETER INCHES	***SMOOTH STEEL PIPE MINIMUM THICKNESS***
12 & under	3/16 ASTM A53
15 – 24	1/4 ASTM A53
30 – 36	5/16 AWWA C201
48 – 78	As specified by the Engineer of Record

Equip jacked casings with nipples at the springline and crown at 10-foot centers when pressure grouting is specified.

207.02.04 Grout

Grout for filling the annular space between the carrier pipe and casing pipe shall be a mixture of Portland Cement, sand, and pea gravel proportioned to allow complete filling of the annular space. The mixture shall have a creamy consistency that enables it to be pumped with a concrete pump.

Grout for pressure grouting outside jacked carrier or casing pipe shall be a mixture of Portland Cement (Type 1P) and water proportioned to allow complete filling of all voids. The maximum allowable slump shall be 5-inches.

207.02.05 Stainless Steel Bands

One-half-inch wide by 0.020-inch thick steel bands or approved equal.

207.02.06 Supports, Skids, and Casing Spacers

Casing spacers shall be used on all pipes within the casing, as manufactured by Cascade Waterworks Manufacturing, or approved equal.

207.03 Construction

207.03.01 General

Conform to all federal, state and local laws and regulations pertaining to tunneling and specifically to the standards set forth by OSHA.

Before the start of the work, submit satisfactory evidence to the Project Manager that all insurance coverage requirements called for by the permitter have been complied with. If required, proposed construction methods and materials shall be submitted to the permitter before the start of construction. Written authorization to proceed from the permitter shall be submitted to the Project Manager before the start of construction.

Prior to starting construction, all required labor, materials, and equipment shall be on the site. Notify all permitters at least 48-hours in advance of working within their right-of-way unless otherwise specified in the permit.

207.03.02 Excavation

Excavation shall be unclassified and shall include whatever materials are encountered to the depths as shown or as required. The Contractor will visit the site and make an estimate of the kind and extent of various materials that may be encountered in the excavation.

207.03.03 Alternate of Jacking or Boring

Jacking or boring may be allowed in lieu of the open trench method. However, written authorization by the Engineer must first be obtained. The Engineer retains the right to reject either the jacking or boring method without rejecting the other. Authorization by the Engineer shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the requirements set forth herein.

207.03.04 Jacking and Boring

Equip the leading section of pipe or conduit with a jacking head securely anchored thereto to prevent any wobble or alignment variation during the jacking or boring operation. For jacking, all excavation shall be carried out entirely within the jacking head and no excavation in advance thereof shall be permitted. For jacking, every effort shall be made to avoid any loss of earth outside the jacking head. Remove excavated material from the pipe or conduit as excavation progresses, and do not allow such material to accumulate within the pipe or conduit.

Jack or bore all pipes or conduits to true line and grade. Should any deviation from true line and grade be considered excessive, in the judgment of the Engineer, the Contractor shall correct at no expense to the City.

Should appreciable loss of ground occur during the jacking or boring operations, backpack all voids promptly. Fill all remaining voids upon completion of the operations; such filling or backpacking shall be with grout.

The design of all sanitary sewer pipe or conduit is based upon the superimposed loads and not upon the loads resulting from the jacking or boring operations. The Contractor shall be responsible for any increase in pipe strength necessary to withstand jacking or boring loads and grouting.

207.03.05 Concrete Pipe and Box Section

Protect the driving ends of concrete pipe or conduit against spalling and other damage. Intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the bearing stresses. Remove any section of pipe or conduit showing signs of failure and replace with a new section.

207.03.06 Smooth Steel Casing

Join sections of smooth steel casing to be jacked or bored by welding the joints with a continuous weld for full circumference or by other means approved by the Engineer. Provide joints that are capable of resisting the jacking and boring forces without failure.

Brace pipe or conduit installed in a casing to prevent shifting and flotation. Fill the void between the casing and the pipe or conduit with grout unless otherwise specified by the Engineer.

If not shown on plans or specified in the Contract Documents, the casing diameter shall be the option of the Contractor. Provide casing of such strength as to withstand the jacking or boring loads and of such diameter to allow filling the void between the pipe or conduit and casing with the approved material.

207.03.07 Grouting Voids Outside Casing or Carrier Pipe

After the casing, or carrier pipe where no casing is specified, has been jacked or bored into position, pressure grout to fill all voids outside the casing through the grout holes provided. Start grouting at the springline hole at one end and pump grout until grout appears in the grout hole at the crown; then start grouting through the opposite springline hole until grout appears at the hole in the crown. Next grout through the hole at the crown until grout appears in the next set of holes along the

pipe. Plug the holes at the starting point and move to the next set of holes and repeat grouting sequence until full-length of jacked pipe has been grouted. Grouting once commenced at any one point shall be completed without stopping.

Nipples installed in grout holes must be removed and the holes grouted flush with the pipe wall, or nipples should be cut off flush with pipe wall and grouted over, or use flush mount pipe nipples and plugs.

207.03.08 Cased Pipe

Provide casing spacers under barrel of pipe, join pipe and slide into casing. Pipe barrel shall bear continuously on spacers. Pipe installation shall conform to applicable requirements in **Section 301, 401 or 501**, including spacers air testing and line and grade.

Spacers shall be center-restrained configured. Spacers shall be 6 to 12-inches from ends of casing and 6 to 12-inches from each side of joints with one spacer at center of pipe lengths.

207.03.09 Grouting Voids Between Carrier Pipe and Casing

Completely fill the annular space between the casing and the carrier pipe with Type “B” grout per **Subsection 205.02.07B** or as specified. When approved by the Engineer, sand may be used in lieu of grout. Fill the voids by continuously pumping grout from one end of casing pipe until grout appears at the other open end. When grouting, use low pressure grouting equipment. The grouting pressures shall not be greater than the design loads of the carrier pipe. The Contractor shall, at his sole expense, remove and replace any pipe sections that fail during the grouting process.

The ends of the casing shall be sacked and sealed at the ends using wrap around end seals as manufactured by Cascade Waterworks Manufacturing or approved equal.

207.03.10 Railroad Crossings

The right is reserved by the City to require jacking or boring under any or all crossings.

Should open trench construction be required by the City at a railroad crossing, the railroad will take up and relay the tracks at no expense to the Contractor. Submit a schedule of operations to the railroad company and to the City 72-hours before trenching within 20-feet of the railroad right-of-way. Construct the pipe crossing and compact backfill through the track location within 72-hours after the tracks have been removed by the railroad unless otherwise specified.

207.03.11 Contractor's Responsibility

The Contractor shall be fully responsible for settlement or deterioration of the finished crossing until a period of two-years after final acceptance by the City.

207.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

207.04.01 Boring and Jacking

Measurement and payment for bored and jacked pipe or conduit will be made on a linear foot basis, complete in-place. Payment will include, but is not limited to, all excavation, shafts, portals, jacking pits, backfill, lubricant, grouting voids outside of casing, filling the annular space between the pipe and the casing, pipe casing, and all appurtenances.

Where casing is not required but is used at the option of the Contractor, the casing and the backfill between the pipe or conduit and the casing shall be included in the pay item for boring or jacking as applicable and no separate payment for pipe will be made.

Measurement for jacking and boring will be made on a linear foot basis along the centerline of the pipe or conduit between the limits shown. Jacking and boring extensions beyond the limits shown shall be considered to be for the Contractor's convenience, unless ordered in writing, and measurement and payment for said extension shall be made as if the open trench method of construction had been used.

Final payment for each crossing will be made after the Contractor furnishes a satisfactory release from the permitter stating that all claims for labor and materials have been satisfied and that the Contractor's work across the permitter's right-of-way has been completed to the satisfaction of the permitter.

207.04.02 Jacking or Boring In Lieu of Open Trench

Where jacking or boring of a conduit is authorized in lieu of open trench construction, measurement and payment will be made as though the open trench method had been used and will include all the pay items that would have been applicable if the open trench construction method had been used.

208 Concrete Structures

208.01 Description

This section covers Portland Cement Concrete (plain or reinforced; precast or cast-in-place) in bridges, box culverts, retaining walls, catch basins, abutments, piers, footings, foundations, curbs, sidewalks, and similar structures.

208.02 Materials

208.02.01 Portland Cement

Conform to **Section 205**.

208.02.02 Aggregates

Use aggregates that conform to requirements of **Section 205** and the additional requirements contained herein.

208.03 Construction

208.03.01 General

When purchasing concrete from others during performance of the Contract, be fully responsible for such concrete conforming to all requirements contained herein.

208.03.02 Mix Design

208.03.02A Classes of Concrete

Classes of concrete shall designate design field strength of concrete in 28-days (measured in pounds per square inch, psi) followed by maximum size of aggregate to be used in the concrete, i.e., Class 3300–1 1/2 shall constitute a mix with a compressive strength of 3300psi in 28-days with 1½-inch maximum size aggregate used in that concrete.

Use the class of concrete as specified or shown for each component part of the project. If not so specified or shown, use Class 3300–1 1/2 concrete.

In all precast, prestressed concrete members in the stems of post-tensioned box girders and in all other members where the spacing of reinforcement is less than 2-inches, use 1-inch maximum size aggregate, unless specified otherwise.

208.03.02B CLASSIFICATION AND PROPORTIONING OF CONCRETE MIXTURES

Before beginning any concrete work, the Contractor shall submit a concrete mix design to the Project Manager.

During progress of the work, if concrete strength and quality, as determined by the test results, fail to attain the requirements specified, suspend all concrete work and make necessary adjustments to obtain required results.

A mix using different proportions or aggregate sizes of any concrete materials in the mix may be requested by the Engineer. Any requested and authorized alteration to proportions of any of the concrete materials in the mix shall be made at the Contractor's sole expense.

The Contractor shall design the mix to meet the following requirements unless otherwise specified:

A. Entrained air range 3% to 6% (percent by volume) - AASHTO T 152.

B. Slump range 2-inches to 4-inches - AASHTO T 119.

C. When using ¾-inch maximum size aggregate, the fine aggregate shall be between 40% and 48% of the total aggregate used.

D. When using 1½-inch maximum size aggregate, the fine aggregate shall be between 35% and 45% of the total aggregate used.

E. When specified, use a water-reducing admixture in conformance with manufacturer's recommendations.

Tests for strength shall be made in accordance with the following:

Molding concrete specimens in the field – AASHTO T 23

Compressive strength of molded cylinders – AASHTO T 22

Curing of cylinders shall conform to AASHTO T 23 except as modified herein.

208.03.03 CONSISTENCY

In general, use a mixture that contains the minimum amount of water consistent with required workability. Consistency of concrete shall be gauged by ability of equipment to properly place it without segregating or honeycombing, and not by the difficulty in mixing or transporting.

208.03.04 MEASUREMENT OF MATERIALS

Provide facilities for weighing and accurately measure all materials by weight, except water, when batching concrete; weigh fine and coarse aggregates separately. Take representative samples and determine moisture content for each kind of aggregate. Store or handle aggregates so that their water content remains constant during any day's run. Equipment for weighing materials shall provide convenient and positive means of determining quantities in the batch of concrete, and means shall be provided for addition or removal of small quantities of materials to obtain exact weight per batch. Device for measuring water shall show accurately the quantity in gallons and be so designed that the water supply will be automatically cut off while water is being discharged into the mixer. Water shall be assumed to weigh 8.34 pounds per gallon.

208.03.05 MIXING

208.03.05A GENERAL

Machine mix all concrete. Ready-mix concrete may be used if it meets all specified requirements herein.

208.03.05B MIXING AT THE SITE

Mix concrete thoroughly in a batch mixer of a size and type that will ensure a uniform distribution of materials throughout the mass.

Equip mixer with adequate water storage and a device for accurately measuring and automatically controlling amount of water used in each batch. Preferably provide mechanical means for recording the number of revolutions for each batch and automatically preventing discharge of mixer until materials have been mixed the required minimum time.

Remove entire contents of the mixer from the drum before materials for a succeeding batch are placed therein. Deposit materials composing a batch simultaneously in the mixer. Do not use any mixer having a rated capacity of less than 1-sack batch. Do not charge a mixer in excess of its rated capacity.

Mix all concrete for a period of not less than 1½-minutes after all materials, including water, are in the mixer. During the period of mixing, operate at a design speed of not less than 14 or more than 20 revolutions per minute.

The first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand, and water to coat the inside of the drum without reducing the required mortar content of the mix. Upon cessation of mixing for a considerable period, clean the mixer thoroughly.

The above specification contemplates the use of conventional revolving drum type mixers. Other types may be used with written permission of the Engineer.

208.03.05C TRUCK MIXING

Unless otherwise authorized by the Engineer, use only revolving drum type truck mixers that are watertight and so constructed that concrete can be mixed to ensure a uniform distribution of materials throughout the mass.

Accurately measure all solid materials for concrete in accordance with **Subsection 208.03.04** and charge into the drum at the proportioning plant. Except as subsequently provided, equip the truck mixer with a tank for carrying mixing water. Place only the prescribed amount of water in the tank unless the tank is equipped with a device by which quantity of water added could be readily verified. Mixing water may be added directly to the batch, in which case a tank will not be required. Truck mixers may be required to be provided with means by which the mixing time can be readily verified by the Engineer.

Do not allow any batch in a truck mixer to exceed the maximum rated capacity of mixer as stated by the manufacturer and stamped in metal on the mixer. Continue truck mixing for not less than 70 revolutions or more than 100 revolutions of the drum at the rate of rotation designated by the manufacturer and stamped in metal on the mixer. Commence mixing after all ingredients, including water, are in the drum. Additional mixing, if any, shall be of the rate of rotation as designated by the manufacturer as agitating speed. Begin mixing within 30-minutes after cement has been added to either the water or the aggregate. When cement is charged into a mixer drum containing water or surface-wet aggregate and when the temperature is above 90º F, or when high-early strength Portland Cement is used, reduce this limit to 15-minutes.

208.03.05D Partial Mixing at Central Plant

When a stationary mixer is used for partial mixing of concrete (shrink-mixing), mixing time in stationary mixer may be no more than is required to intermingle the ingredients. After transfer to a truck mixer, further mixing at a designated mixing speed will be required only as necessary to meet the requirements for uniformity of concrete as specified for truck mixing.

208.03.05E Plant Mix

Conform mixing at a central plant to requirements for mixing at the site.

208.03.05F Time of Hauling and Placing Mixed Concrete

Completely discharge and place in the forms all concrete transported to the project in a truck mixer or truck agitator within 90-minutes after material is placed in the truck or before 250 revolutions of the truck drum or blades, whichever comes first.

Reduce this time during conditions that contribute to accelerated setting of concrete, or when temperature of concrete is 85º F or above.

Add no water to concrete during hauling or before discharge, unless ordered by the Engineer of Record. Engineer of Record shall not generally approve any water addition that increases the slump by more than 1-inch or exceeds the design water-cement ratio.

208.03.05G Delivery

Utilize a plant capacity and transportation equipment that are adequate to ensure continuous delivery of concrete during concreting operations and that will provide for proper handling, placing, and finishing of the concrete. Use a rate of delivery such that the interval between batches does not exceed 20-minutes. Methods of delivery and handling concrete shall allow placing with a minimum of rehandling and without damage to the structure or concrete. Time interval may be reduced when deck concrete is being placed. Control delivery of concrete for decks so that deck pour will progress at a rate of not less than 20-feet per hour unless some other rate of pour is specified.

208.03.05H Retempering

Mix concrete only in such quantities as are required for immediate use and do not use any that has developed initial set. Concrete that has partially hardened shall not be retempered or remixed.

208.03.06 Falsework

For structures requiring poured-in-place concrete superstructures, working drawings and calculations for falsework, prepared by the Engineer of Record, may be required to be submitted to the City for review. For a guideline on designing formwork and falsework, the Contractor shall refer to the current version of the ACI Standard, "Recommended Practice for Concrete Formwork" (ACI 347-68).

Design and construct all falsework to support the total applied loads with a deflection/span ratio not to exceed 1/500 in any falsework span. Employ screw jacks or hardwood wedges to take up any settlement in formwork either before or during the placing of concrete. Set falsework for p-ost-tensioned structures to carry full dead load and any additional vertical or horizontal loads caused by the prestressing operation.

Contractor is directed to the fact that post-tensioned structures are not self-supporting until post-tensioning is complete and Contractor shall consider this fact in the design, maintenance, and protection of falsework.

208.03.07 FORMS

Forms shall be constructed for all concrete work. Adjacent surfacing such as asphaltic concrete shall not be used as a form for placing concrete. Make all forms mortar-tight; set them so finished concrete will conform to the proper dimensions and contours; and make them sufficiently rigid to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Construct and maintain forms to prevent warping and opening of joints.

Design forms to withstand the effects of vibration of concrete as it is placed.

Support deck forms for concrete box girder spans by girder stems. Posts or other supports for deck forms will not be permitted to come in contact with the bottom slab of the box girder.

Make wood forms for concrete surfaces, not subject to backfill, of dressed lumber of uniform thickness with a form liner of an approved type. Wood forms for interior cells of box girders may be made with or without a form liner. Shiplap or S4S boards are acceptable provided forms are mortar-tight. Plywood will be acceptable as a form liner if sufficiently supported. Ensure that all formwork for exposed concrete surfaces is smooth with the grain running in the same direction to give a good finished appearance. Construct metal ties or anchorages within forms to permit their removal to a depth of at least 1-inch from face without injury to the concrete. Where wire ties are permitted, all wires, upon removal of forms, shall be cut back at least ¼-inch from the face of the concrete with chisels or nippers; for green concrete, nippers are necessary. Design all fittings for metal ties so that upon their removal, cavities that are left will be of the smallest possible size. Fill cavities with cement mortar and leave surface sound, smooth, even, and uniform in color.

Fillet forms at all sharp corners and bevel or draft all projections, such as girders and copings, to ensure easy removal. For narrow walls and columns, where the bottom of the form is inaccessible, leave the lower form boards loose so that they may be removed for cleaning out extraneous material immediately before placing of the concrete.

Keep the forms in place for periods that shall be determined hereinafter. When the forms appear to be unsatisfactory in any way to the Inspector, either before or during the placing of concrete, work shall be stopped until defects have been corrected.

Maintain shape, strength, rigidity, water-tightness, and surface-smoothness of re-used forms at all times. Do not re-use warped or bulged lumber, and do not re-use any forms which are unsatisfactory in any respect. Thoroughly clean re-used forms of all dirt, mortar, and foreign matter.

Treat all forms with form oil or wax or saturate with water immediately before placing concrete. Do not use material that will adhere to or discolor the concrete.

208.03.08 REMOVAL OF FALSEWORK AND FORMS

Assume full responsibility for all damage resulting from premature removal of forms. Do not place earth backfill against walls below grade, and do not remove forms and shoring from structural slabs or beams until concrete has reached an actual field strength equal to 75% of the specified 28-day design field strength. Actual field strength shall be determined from field cured test cylinders that shall be cured under conditions equivalent to the most unfavorable conditions for the portions of concrete that the cylinders represent.

Do not use methods of form removal likely to cause over-stressing of the concrete. Remove supports in such a manner as to permit concrete to uniformly and gradually take the stresses due to its own weight.

Remove all form work from cells of concrete box girders to which access is provided and all form work, except that necessary to support deck slab, from the remaining cells of the box girder.

208.03.09 WEATHER LIMITATIONS

208.03.09A GENERAL

The Contractor shall assume full responsibility for the concrete work during any weather conditions, including, but not limited, too hot and cold weather. Any work not in conformance to the Contract Documents may be rejected by the Project Manager. Replacement or repairs shall be at the Contractor's sole expense.

208.03.09B HOT WEATHER

Take special precautions for hot weather in placing, finishing, and curing concrete when the ambient temperature reaches 85º F or higher and whenever relative humidity, wind velocity, or exposure to the sun at lower air temperatures are expected to cause hot weather conditions for the concrete. Specify cool materials for the mix; add additional water to the forms, subgrades, and other areas to be in contact with concrete, but allow no standing water when concrete is placed; schedule work carefully to place and finish concrete as rapidly as possible; reduce evaporation from the concrete with windbreaks, covers, and fog nozzles; and begin curing as soon as possible.

208.03.09C COLD WEATHER

Do not place concrete when ambient temperature is below 35º F. Enclose structure in such a way that concrete and air within the enclosure can be kept above 50º F for a period of 7-days after placing the concrete. When enclosures are used to maintain specified temperatures, furnish a 24-hour temperature-recording thermometer to record all temperature within the enclosure.

Supply heating apparatus such as stoves, salamanders, or steam equipment and the necessary fuel. When dry heat is used, provide means of maintaining atmospheric moisture. Heat all aggregates and mixing water to a temperature of at least 70º F, but not more than 150º F; aggregates may be heated by either steam or dry heat.

Where practicable, forms insulated with at least 2-inch thick blankets made of fiberglass, rock wool, balsam wood, or similar commercial material capable of maintaining the surface of the concrete at no less than 50º F may be used in lieu of other protection of concrete involving housing and heating. When forms are insulated, protect exposed horizontal surfaces with a similar layer of the insulating materials securely fastened in place. If insulated forms do not maintain proper temperature at the surface of the concrete, use auxiliary protection and heat. The Contractor may also use plastic and straw to protect the concrete. The Contractor will keep the straw confined to the surfaces being protected and clean up all materials as soon as the concrete no longer requires the protection. No staining of the concrete will be accepted due to the use of straw as a method of protection.

208.03.10 HANDLING AND PLACING

208.03.10A GENERAL

In preparation for placing of concrete, remove all sawdust, chips, and other construction debris and extraneous matter from interior of forms. Remove struts, stays, and braces, serving temporarily to hold forms in correct shape and alignment prior to placing of the concrete when the concrete has reached a position rendering their service unnecessary. Remove these temporary members entirely from the forms and do not leave them buried in the concrete.

Do not use concrete that does not reach its final position in forms within time stipulated in **Subsection 208.03.05F**.

Place concrete so as to avoid segregation of material and displacement of reinforcement. Do not use long troughs, chutes, and pipes for conveying concrete from mixer to forms.

For open troughs and chutes, use steel or steel lined material. Where steep slopes are required, equip chutes with baffles or make in short lengths that reverse direction of movement. Keep all chutes, troughs, and pipes clean and free from coatings of hardened concrete by thoroughly flushing with water after each run; discharge water used for flushing clear of structure and do not discharge into any sewer or culvert or appurtenances thereto.

When placing-operations would involve dropping concrete more than 3-feet, deposit through an "elephant trunk." Aluminum pipe will not be allowed.

After initial set of concrete, do not jar forms nor place strain on the ends of the reinforcing bars that project out of the concrete.

Thoroughly compact concrete during and immediately after depositing.

Provide compaction by mechanical vibration subject to the following provisions:

A. Use internal vibration or other methods provided herein.

B. Use vibrators of a sufficient type and design, capable of transmitting vibration to concrete at frequencies of not less than 4,500 impulses per minute.

C. Provide intensity of vibration such as to visibly affect the mass of the concrete of 1-inch slump over a radius of at least 18-inches.

D. Provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in forms.

E. Manipulate vibrators so as to thoroughly work concrete around reinforcement and embedded fixtures and into corners and angles of forms.

F. Apply vibration at the point of deposit and in the area of freshly deposited concrete. Insert vibrators and withdraw from concrete slowly. Use vibration of sufficient duration and intensity to thoroughly compact concrete but do not continue so as to cause segregation. Do not continue vibration at any one-point to the extent that localized areas of grout are formed.

G. Make application of vibrators at points uniformly spaced and not farther apart than twice the radius over which vibration is visibly effective.

H. Do not apply vibration directly or through reinforcement to sections or layers of concrete that have hardened to the degree that concrete ceases to be plastic under vibration. Do not use vibration to make concrete flow in forms over distances so great as to cause segregation, nor to transport concrete in forms.

I. Supplement vibration by such spading as is necessary to ensure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with vibrators.

Place concrete in horizontal layers not more than 12-inches thick except as hereinafter provided. When less than a complete layer is placed in one operation, terminate in a vertical bulkhead. Place each layer and compact before the preceding layer has taken initial set to avoid surfaces of separation between the layers. Compact each layer so as to avoid formation of a surface of separation with a preceding layer.

When placing of concrete is temporarily discontinued and after concrete has become firm enough to retain its form, clean off laitance and other objectionable material to a sufficient depth to expose sound concrete. Smooth top surface of the concrete adjacent to forms with a trowel. Where a "feather edge" might be produced at a construction joint, as in the sloped top surface of a wing wall, use inset formwork to produce a blocked out portion in the preceding layer that produces an edge thickness of not less than 6-inches in succeeding layer. Do not discontinue work within 18-inches of the top of any face unless provision has been made for a coping, in which case a construction joint shall be made at the under side of the coping.

208.03.10B PUMPING

Placement of concrete by pumping will be permitted provided clean equipment is used that is of sufficient size and capacity to satisfactorily handle the concrete mix specified. For discharge line of pump, use steel or rubber pipe. Provide additional cement or additives required to obtain a pumpable mix at the sole expense of the Contractor.

Furnish evidence of backup means of placing structural concrete in the event of failure of equipment during placement.

208.03.11 CONSTRUCTION JOINTS

208.03.11A GENERAL

Use construction joints only where shown or designated in the Contract Documents, unless otherwise specified. Taper wooden key forms and pre-soak or treat to prevent swelling. When placing operation is interrupted for any reason, place construction joints and provide with keys to resist shear and dowels to develop bond. Construction joints for curbs, gutters, driveways, and sidewalks shall conform to **Subsection 607.03.07**.

208.03.11B BONDING

Before depositing new concrete on or against concrete that has hardened, the forms shall be retightened. The surface of the hardened concrete shall be roughened in a manner that will not leave loosened particles or aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance and saturated with water. At the juncture of the hardened and the newly deposited concrete, the cleaned and saturated surfaces, including vertical and inclined surfaces, shall first be thoroughly covered with a coating or mortar or neat cement grout against which the new concrete shall be placed before the grout has attained its initial set.

The placing of concrete shall be continuous from joint to joint. The face edges of all joints that are exposed to view shall be carefully finished true to line and elevation.

208.03.12 EXPANSION AND FIXED JOINTS

Construct all joints according to details shown.

208.03.12A OPEN JOINTS

Place open joint in locations shown. Construct by insertion and subsequent removal of a template without chipping or breaking corners of the concrete. Do not extend reinforcement across an open joint unless so shown.

208.03.12B FILLED JOINTS

Construct poured expansion joints similar to open joints. When pre-molded types are specified, drive nails at about 1-foot on centers through filler to provide anchors into concrete when it is placed. Place pre-molded joint filler in forms in proper rigid position before concrete is poured.

208.03.12C STEEL JOINTS

Shape plates, angles, or other structural shapes accurately at the shop to conform to the section of concrete. Fabricate and paint to conform to requirements of these specifications. Take care to ensure that surface in finished plane is true and free of warping. Employ positive methods in placing joints to keep them in correct position during placement of concrete. Opening at expansion joints at normal temperature shall be as shown. Do not impair clearance in any manner.

208.03.12D PREFORMED ELASTOMERIC JOINT SEALS

Use compression joint seals in the longest practicable lengths for longitudinal joints. In transverse joints, one factory splice will be permitted in joint seals where required length of material in any one joint exceeds manufacturers' standard stock lengths. Make such splices are true and smooth on outside surfaces with no offsets of abutting sections and with complete bond on all abutting surfaces. Make joints clean and dry and free of spalls and irregularities that would impair a tight seal in service. Place seals in the joint under compression, as recommended by manufacturer, using a lubricant adhesive as a covering film applied to both sides of the seal just prior to its installation.

For lubricant adhesive material, use a compound of same base polymer as the joint seal with which it is used, blended with a suitable volatile solvent. Lubricant adhesive shall be compatible with joint seal and concrete and be relatively unaffected by normal moisture in the concrete. It shall maintain a suitable consistency at the temperature at which joint seal is installed.

Set seal as shown and make sure it contacts walls of joint throughout its length. Longitudinal elongation of an installed seal by 3% or more of its original length will be cause for its removal and reinstallation.

Remove all lubricant adhesive that comes upon the exposed top of an installed seal before it dries, and remove all seals that show twist, curl, nicks, or other malformation as installed. Seal all ends of preformed elastomeric joint seals with watertight plug prior to installation of joint seal. Use a foam rubber plug or other acceptable closed-cell cellular material that is compressible to 15% of its uncompressed thickness. Plug shall be a minimum of 2-inches in length and be secured in elastomeric joint seal with an adhesive that will ensure a watertight plug.

208.03.13 SURFACE FINISHING

208.03.13A GENERAL

After forms have been removed, carefully point all depressions resulting from removal of form ties, or from other causes, with mortar conforming to **Section 205**. Maintain thorough saturation of concrete surface during pointing and patching. Type of finish to be used shall be as specified or as shown.

208.03.13B SLAB FINISHES

A. **General –** Refrain from excessive use of "jitterbugs" or other special tools designed for the purpose of forcing coarse aggregate away from slab surface. Dusting of surfaces with dry materials will not be permitted. Compact slabs and floors thoroughly by vibration. Round off edges of slabs and tops of walls with a ½-inch radius, steel-edging tool unless specified otherwise.

B. **Monolithic Finish –** Finish by screeding and floating with straightedge to bring surfaces to the required finish elevation shown. While concrete is still green, but sufficiently hardened to bear a person's weight without deep imprint, wood float to a true, even plane with no coarse aggregate visible. Apply sufficient pressure on

wood floats to bring moisture to surface. After surface moisture has disappeared, steel trowel concrete to produce a smooth, impervious surface free from trowel marks. Give an additional troweling to surface for the purpose of burnishing. Final troweling shall produce a ringing sound from the trowel. Do not use dry cement or additional water in troweling. Do not use excessive troweling.

C. **Rough Slab Finish –** Finish slabs to receive fill and mortar setting beds by screeding with straightedges to bring surface to required finish plane. Remove all laitance and leave surface clean. Subject to approval, an acceptable aggregate-revealing material may be used and laitance washed off when concrete has set.

D. **Wood Float Finish –** Finish by screeding with straightedges to bring surface to required line as shown. While concrete is still green, but hardened sufficiently to bear cement finisher's weight, work flat surface to a true and uniform plane with no coarse aggregate visible.

E. **Broomed Floor Finish –** Finish concrete as specified for monolithic finish above, except omit final troweling, and finish surface by drawing a fine-hair broom lightly across surface. Broom water reservoir roof slab surface in radial direction. Do all other brooming in same direction and parallel to expansion joints; or in cases of inclined slabs, perpendicular to slope.

F. **Power Machine Finish** – In lieu of hand finishing, a power machine may be used for finishing concrete floors and slabs in conformance with directions of machine manufacturer.

208.03.14 Curing

Immediately after the final floating, surface finishing, and edging has been completed and while the concrete surface is still moist, cover the entire exposed concrete and cure in accordance with one of the following provisions as specified.

A. Apply membrane-forming compound of the white-pigmented type uniformly to damp concrete by pressure-spray methods at a rate that will form an impervious membrane when tested in accordance with AASHTO T 155.

B. Apply white polyethylene film, waterproof paper, or burlap polyethylene sheets to damp concrete as soon as it can be placed without marring the surface. Place in intimate contact with the surface, extend over and beyond the sides or edges of the slabs or forms, and use a weight as approved to hold the covering in position as a moisture proof covering. Laps shall be of approved dimensions and design to maintain tightness equivalent to the covering.

Use covering that is best suited to existing conditions. Regardless of which of the above methods the Contractor chooses, keep the curing medium intact and effective for a period of not less than 72-hours after application.

208.03.15 Protection of Concrete

Protect slab concrete exposed to conditions causing premature drying during placing operations by providing wind breaks, fog spray, or by other necessary methods.

Erect and maintain suitable barriers to protect the concrete from traffic or other detrimental trespass until the pavement is opened to traffic. If necessary, maintain watchmen to ensure that barriers remain effective.

Whenever it is necessary that traffic, including Contractor's vehicles and equipment, be carried from one side of the concrete surface to the other, construct and maintain suitable bridges over the pavement.

Prior to allowing equipment or traffic on the new surface, the concrete must have attained the specified compressive strength and shall be free from scarring, abrasion, stones, loose mortar, and other matter apt to be deleterious to the concrete surface. Operate all equipment without damage to the new concrete.

Repair or replace any part of the pavement, as directed, which has been damaged by traffic or from any other cause, prior to its official acceptance, at no expense to the City.

208.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

208.04.01 CONCRETE

Concrete will be measured on a lump sum basis, square yard surface basis, square foot surface basis, or on a cubic yard basis for payment as shown in the Contract Documents. In all cases the part or parts of work to be measured on each basis shall be as shown and as specified.

When reinforcing steel, metal expansion plates, or miscellaneous metal items are not specified or shown as a separate pay item in the Contract Documents, payment for said item is considered to be incidental to the related item of work and no separate payment will be made.

208.04.01A LUMP SUM BASIS

Measurement and payment will be made on a lump sum basis as shown in the Contract Documents.

208.04.01B SQUARE YARD SURFACE BASIS

Measurement and payment will be made on a square yard surface basis for each class of concrete as shown in the Contract Documents.

208.04.01C SQUARE FOOT SURFACE BASIS

Measurement and payment will be made on a square foot surface basis for each class of concrete as shown in the Contract Documents.

208.04.01D CUBIC YARD BASIS

Measurement and payment will be made on a cubic yard basis for each class of concrete as shown in the Contract Documents.

209 LANDSCAPING AND LANDSCAPE RESTORATION

209.01 DESCRIPTION

This section covers the work necessary for finish grading, addition of topsoil, fertilizer, and weed control, establishment of lawns or grass areas by sod or seeding; and maintenance of lawn or grass areas, mulching, fertilization, and planting of ground cover; establishment of nursery stock, such as trees, shrubs, and small plants; and maintenance of ground cover and nursery stock, irrigation system, and subsurface drainage.

209.02 MATERIALS

209.02.01 PLANTS

Names of plants to conform to standardized names of the American Joint Committee on Horticultural Nomenclature. Names of varieties not included therein conform to names generally accepted in the nursery trade. Provide plants that are nursery-grown with habit of growth that is normal for the species, sound, healthy, vigorous, and free from insects, diseases, and injuries and equal to or exceeding measurements specified when measured before pruning with branches in normal position. Provide sizes and methods of handling according to the code of standards recommended by the American Association of Nurserymen (AAN).

209.02.02 SEED

Provide tested grass and legume seed from the latest crop available. Deliver each variety or mixture in standard containers labeled in accordance with Oregon State laws and U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Provide with label showing the date of testing (must be within 9-months of date of delivery) and location of where the original stock seed originated. Seed must be certified as “Oregon Certified Seed” at the time of planting. The current certified seeds are found in the most recent edition of the “Oregon Certification Acres Applied for Certification Summary”. The minimum requirements of Oregon certified seed are published in the current year’s “Oregon Certified Seed Handbook”. Both certified seed references are available from County Extension Offices or Oregon State University. Mold or evidence of container having been wet or otherwise damaged will be cause for rejection of each lot of seed.

209.02.03 SOD

Provide grass sod that is from a certified or approved source, strongly rooted, and free of pernicious weeds. Sod should be composed of several seed varieties excluding blue and bent grass varieties.

209.02.04 TOPSOIL

Conform to the applicable requirements of **Subsections 206.02.07 and 206.02.08**. Stormwater facility topsoil shall comply with the *City of Gresham Stormwater Management Manual*.

209.02.05 SAND

Conform to the requirements of **Subsection 206.02.03**.

209.02.06 ORGANIC MATERIAL FOR SOIL AMENDMENT

Use a peat consisting of natural residue formed by decomposition of reeds, sedges, or mosses from freshwater site. Peat must be free from lumps, roots, and stones and capable of absorbing at least 4-times its dry weight of water. It must contain organic matter not less than 90% on a dry weight basis, and have a maximum moisture content at time of delivery of 65% by weight. For stormwater facilities, follow the soil amendment specifications as required by the *City of Gresham Stormwater Management Manual*.

209.02.07 LIME

Provide a lime composed of ground dolomitic limestone not less than 85% total carbonates and magnesium; ground so that 50% passes #100 sieve and 90% passes #20 sieve. Coarser material may be acceptable provided the specified rates of application are increased proportionately on the basis of quantities passing #100 sieve.

209.02.08 SUBDRAINS

Use perforated PVC drainpipe. Perforated PVC pipe shall conform to ASTM D1785, Schedule 40. The perforations shall consist of 2-rows of 2-inch slots. The slots shall be transverse to the axis of the pipe. Two rows of slots shall be 120º on centers. Slot size shall be 0.4-inches.

209.02.09 IRRIGATION AND WATER SYSTEMS

209.02.09A PIPE

Use PVC pipe meeting the requirements set forth in Federal Specification P22-70 with an appropriate standard dimension ratio, conforming to ASTM D2241 and fittings of PVC with deep socket dimensions conforming to ASTM D2466.

209.02.09B GATE VALVES

Install the following gate valves: Up to and including 3-inches with bronze bodies; 4-inches and larger with either bronze or iron bodies, all having bronze stems, bronze seat rings, and bronze disc faces and conforming to ASTM B62.

209.02.09C PRESSURE-REDUCING VALVES

Use adjustable, heavy-duty bronze pressure reducing valves. Must have approved stainless steel or Monel strainer to permit quick cleaning or replacement without dismantling or removing the valve from the line and with integral or independent union.

209.02.09D CONTROL VALVES

Provide manual control valves of molded plastic, brass, or bronze for underground installation. Valves shall have cross or slot-type handle for operation with a standard key, a removable bonnet and stem assembly, an adjustable packing gland, a rising stem to assure full opening of the valve, a renewable disc-type washer seat, and an integral or independent union.

Use electrically-operated control valves of molded plastic, bronze, brass, or stainless steel. These shall be of the normally-closed type, having an open or close time greater than 4-seconds, and capable of manual control during power failure. Provide with a motor assembly or operating parts that are removable without disturbing the valve body. Must be all waterproof for underground burial, and with integral or independent union for supply line connection.

209.02.09E QUICK-COUPLING VALVES

Supply one-piece or two-piece body-type, locking cap, having body of approved heavy-duty brass or bronze, watertight before and after the coupler is inserted, and designed so that the valve seat is closed before the coupler is removed. Provide valve couplers, keys, and hose swivels of compatible design to quick-coupling valves.

209.02.09F RISERS

Connect sprinkler heads and quick-coupling valves to PVC pipe water supply lines with PVC pipe risers and with an approved swing joint.

209.02.09G BACKFLOW PREVENTERS

Use either reduced-pressure or double check assemblies, as indicated in Contract Documents, of a type and size approved by the City.

209.02.10 FERTILIZER

Use fertilizer conforming to the recommended content as provided for in **Subsection 209.03.02**. Furnish fertilizer in moisture-proof bags with weight and the manufacturer's certified analysis

of the contents showing the percentage for each ingredient. Furnish fertilizer in a dry condition, free from lumps and caking, in a uniform-granular or palletized form of standard commercial grade conforming to all state and federal regulations and to the standards of the Association of Official Agricultural Chemists. Fertilizer may be furnished in bulk form if an approved transfer hopper is provided. Do not apply fertilizer to stormwater facilities without written approval from the Engineer.

209.02.11 Mulch and Ground Covers

Unless in stormwater facilities, use one or more of the following types of mulch:

A. Organic mulch of clean, ground Douglas fir or hemlock bark graded so that 50% consists of particles larger than ¼-inch, but not exceeding 1-inch, and 20% will pass a #10 sieve.

B. Fiber-glass mulch of approved commercial grade fiber-glass yarn mat.

C. Straw mulch of threshed straw of oats, wheat, or rye, free from seed of noxious weeds or clean salt hay.

D. On steep slopes use approved mesh to reinforce mulch or plantings such as fiber mulch of heavy, twisted jute mesh, or other material as approved, with openings between strands approximately 1-inch square.

E. Spray mulch of a verdyol complex with nontoxic, 100% organic, water-soluble powder-binding agent with silva fiber used in hydraulic seeding operations.

In stormwater facilities, mulch shall be compliant with the requirements in the *City of Gresham Stormwater Management Manual*.

209.02.12 Tie-Downs

Use one or more of the following materials as needed:

A. Eye-bolt masonry anchors of galvanized steel with approved lead shield or flush shell for setting into masonry joint or concrete.

B. 2-inch x 2-inch x 96-inch clear, straight cedar wood stakes.

C. 12-gauge pliable galvanized steel wire for guys or for fastening trees to stakes.

D. 2-ply reinforced rubber garden hose for guy wire encasement having a minimum ⅝-inch diameter threaded openings fitted with screw eyes.

E. Zinc-coated turnbuckles with a 6½-inch lengthwise opening and ⅜-inch diameter threaded openings fitted with screw eyes.

209.02.13 Soil Sterilant

Soil sterilant shall be approved by the Engineer and shall be applied conforming to manufacturer's recommendations.

209.03 Construction

209.03.01 General

Conform to the following standards, the manufacturer's and supplier's recommendations and instructions, and to accepted practices in the industry.

209.03.02 Soil Test

If directed by the Engineer, have a soil test performed. The test may be performed by any Oregon State University County Extension Agent or by any other approved soils testing laboratory. The soils analysis shall provide a chemical analysis of the soil and recommendations for soil improvement for the vegetation to be grown. The recommendations shall be used to select the particular fertilizer and soil improvement materials to be used prior to planting.

209.03.03 Lawns and Grass

209.03.03A Project Schedule

Within 20-calendar-days of the date specified for commencement of work, submit for approval a time schedule indicating dates for beginning and completion of the following operations:

A. Delivery of materials

B. Preparation of seedbed

C. Planting grass

D. Maintenance

209.03.03B Delivery, Handling, and Storage of Sod

Deliver sod immediately on lifting and after lawn bed is prepared for planting. Protect sod from drying by covering during delivery to protect from sun and wind. Store materials only in designated areas.

If sod is not laid within 2-days of delivery, spread out flat with grass side up in cool place and keep moist. Rolled or stacked sod that becomes yellow will not be accepted.

209.03.03C Preparation of Subgrade

After rough grading is completed and before topsoil is spread, apply lime and/or super phosphate, as determined by soil analysis, and mix to a depth of 4 to 6-inches. Conform to manufacturer's recommendations for applying lime and super phosphate simultaneously and schedule application(s) accordingly.

209.03.03D Subsurface Drainage

Lay drainage pipe as specified in **Subsection 209.02.08** on firm bed of ¾”-0” crushed rock with minimum fall of 0.5% and located and sized as shown on the plans. Begin laying pipe at the outlet end of the pipeline and proceed upgrade. Install PVC drainpipe with slots facing upward. Place pipe at a minimum depth of 24-inches and not any deeper than required to produce minimum fall. Backfill trenches and pipe zone with 1½ to ¾-inch crushed rock to within 4-inches of subgrade. Cover backfill with fiberglass mat or approved material to prevent infiltrations of soil.

Complete backfilling of trenches with a 4-inch layer of coarse sand as specified in **Subsection 206.02.03** and tamp for compaction, as approved.

209.03.03E Topsoil and Finish Grading

Spread topsoil and soil conditioner over the prepared rough grade using a rubber-tired tractor with grader blade or equivalent, weighing a maximum of 3½-tons. Imported topsoil must be incorporated with at least a 2-inch layer of subsoil. Thoroughly mix the applied materials to a depth of 8-inches using a disc or cultivator over the entire area in two directions at right angles. Rake topsoil areas to a uniform grade so that all areas drain as shown on the plans or as approved.

Remove all trash and any stones exceeding 1-inch in diameter from the area to a depth of 2-inches prior to preparation and planting grass.

For work in the right-of-way, not a part of a larger grading project, see **Subsection 601.03.02**.

209.03.03F SOIL STERILANT

Apply specified soil sterilant at the rate recommended and by the method approved by the manufacturer or as specified in the Contract Documents.

209.03.03G SEEDING

Plant grass seed only at times when local weather and other conditions are favorable to the preparation of the soil and to the germination and growth of grass seed. Sow grassed areas evenly with a mechanical spreader at the recommended rate and method approved by Oregon Department of Agriculture Extension Service. Method of seeding may be varied as approved; however, the responsibility to establish a smooth, uniformly-grassed area will not be waived. Hydroseeding will be permitted unless otherwise specified.

209.03.03H SODDING

Before sod is laid, correct soft spots and irregularities in grade of the prepared bed, as approved by the Engineer. Lay sod and tamp or roll so that no voids occur. Water sod thoroughly. Complete sod surface true to finished grade, even and firm. On slopes steeper than 1 to 2, fasten sod with wooden pins 6-inches long driven through the sod into the soil, flush with the top of the sod at intervals approved by the Engineer.

209.03.03I MULCHING AND PROTECTION OF SLOPES

Mulch all areas with a slope from 5% to 20% by spreading a uniform light cover of straw mulch over the seeded area at a rate of 1½-tons per acre.

In areas with slopes between 20% and 25%, install erosion control netting. In non-turf areas, cover netting with fir bark mulch.

Mulch all areas with a slope steeper than 25% with spray mulch applied at a rate of 15 gallons per 1,000 square feet after wetting the ground, with water penetrating at least 1-inch deep.

Protect new seeded area from pedestrian traffic. Unless otherwise approved by the Project Manager, erect a fence of 6-foot tall steel fence posts spaced 10-feet on center and strung with orange mesh safety fencing.

209.03.03J MAINTENANCE

Begin maintenance immediately after each portion of lawn is planted and continue for 8-weeks after all lawn planting is completed.

Water to keep surface soil moist. Repair washed-out areas by filling with topsoil, fertilizing, and seeding. Replace mulch on banks when washed or blown away. Repair fencing as needed. Mow to 2-inches after grass reaches 3-inches in height, and mow frequently enough to keep grass from exceeding 2½-inches. Weed by local spot application of selective herbicide only after first planting season when grass is established.

209.03.03K LAWN GUARANTEE

This guarantee is in addition to the standard 2-year warranty period outlined in **Subsection 103.16**. If, at the end of the 8-week lawn maintenance period a satisfactory stand of grass has not been produced, immediately renovate and reseed the unsatisfactory portions of lawn;

or when approved, reseed at the beginning of the next planting season. If a satisfactory stand of grass develops by June 1 of the following year, the lawn will be accepted. If the lawn is not accepted, a complete replanting will be required during the ensuing planting season.

A satisfactory stand is defined as a lawn or section of lawn that has:

A. No bare spots larger than 3-square-feet.

B. Not more than 10% of the total area with bare spots larger than 1-square-foot.

C. Not more than 15% of the total area with bare spots larger than 6-inches square.

209.03.03L Inspection for Acceptance (Not applicable to privately financed public improvements)

Submit a written notice 8-weeks after the start of maintenance on the last section of completed lawn. Within 15-days of such written notice the Engineer will make an inspection of the lawn to determine if a satisfactory stand of grass has been produced.

209.03.04 Trees, Shrubs, and Ground Cover

209.03.04A Delivery, Preparation, and Storage

Dig plants designated in the Contract Documents as balled and burlapped with firm, natural balls of earth of diameter and depth sufficient to encompass the fibrous and feeding root system required for full recovery of the plant. Firmly wrap balls with burlap and bind with twine, cord, or wire mesh. Where necessary to prevent breaking or cracking of the ball during the process of planting, or where the tree exceeds 4-inches in diameter, secure the ball to a platform. Meet or exceed the current edition of AAN standards.

Dig bare root plants during dormant period to remove earth with the least possible injury to the fibrous root system. Cover the roots with thick coating of mud immediately after digging by puddling or wrapping in wet straw, moss, or other suitable packing material for protection until delivery.

Furnish container-grown plants with self-established root systems sufficient to hold earth together after removal from the container but not root-bound. Plants shall have grown for at least 3-months in the container with inside diameter specified. Meet or exceed the current edition of AAN standards.

If plants are not in the dormant state, spray with anti-desiccant to cover foliage, as recommended by manufacturer, prior to digging the plants. During shipment, protect the plants with tarpaulin or other approved covering to prevent excessive drying from the sun and wind.

Cover balls of balled and burlapped plants and containers of container-grown plants that cannot be planted immediately upon delivery with moist mulch to protect from drying. Plant or heel-in bare root plants immediately upon delivery. Water plants as necessary to prevent drying until planted.

Open and separate all bundles of heeled-in bare root plants before the roots are covered. Avoid leaving air pockets among the roots.

209.03.04B Soil Conditioning

After the specified chemical analysis report for topsoil is received, prepare the topsoil mixture for plant pits and beds by thoroughly mixing the approved topsoil with soil conditioner materials, fertilizer, and lime. Thoroughly mix with rotary mixer or other approved method in the following proportions:

Table 209.03.04B SOIL CONDITIONING					
TOPSOIL CLASSIFICATION BY CLAY CONTENT	**REQUIRED MIXTURE RATIO**			**PARTS BY VOLUME**	
	TOPSOIL	**SAND**	**LIME**	**PEAT**	**FERTILIZER***
Clay 5 – 10%	4	0	1	1 lb./CY	½ lb./CY
Clay 10 – 15%	2	2	1	1 lb./CY	½ lb./CY
Clay 15 – 25%	2	4	1	1½ lbs./CY	½ lb./CY
*Adjust in accordance with soil test chemical analysis report per **Subsection 209.03.02**.					

Store and protect topsoil mixture and other materials at designated area of the site. Protect topsoil mixture from excessive leaching by covering with tarpaulin if stored for more than 6-weeks.

For stormwater facilities, in place of conventional soil conditioning, comply with the *City of Gresham Stormwater Management Manual*.

209.03.04C PLANTING PROCEDURES

Within 20-calendar-days after receiving the notice to proceed, submit a time schedule for approval indicating dates for commencement and completion of the following operations:

A. Tagging of plants in the nurseries

B. Survey and staking of plant locations

C. Delivery of topsoil and other materials

D. Digging and preparation of plant pits and beds

E. Delivery of trees and plants to the site

F. Planting of trees and other plants

G. Fertilization and application of pre-emergent herbicide

H. Guying, staking and mulching

I. Completion of work for start of guarantee period

At least 20-days before start of the guarantee period, submit a schedule of proposed maintenance operations indicating the number of man-hours contemplated for each operation by season during autumn, winter, spring and summer.

Locate new planting where shown on plans, except make approved adjustments where obstructions below ground are encountered or where changes have been made in the construction. Place no planting, except ground cover, closer than 18-inches to pavements and structures. Dig plant pits and have soil mixture for planting ready before plants are delivered. Excavate circular pits with vertical sides a minimum of 2-feet greater than the diameter of the ball. For trees, shrubs, and vines, excavate pits to depth sufficient to accommodate ball or roots when plant is set to finished grade. Place 3-inches of compacted soil mixture in the bottom of pit. Set plants upright and face as approved to give the best appearance or relationship to adjacent structures. Remove wire, burlap, and surplus binding from top and sides of balls. Spread roots in normal position. Cut all broken or frayed roots off cleanly. Place prepared soil mixture and compact carefully to avoid injury to roots and to fill voids. When hole is nearly filled, add water as necessary and allow to soak away.

Fill hole to finished grade. When directed by Engineer, form shallow saucer around plant by placing ridge of topsoil around edge of pit 2-feet greater than diameter of ball. After ground settles, fill with additional soil to level of finished grade.

Plant trees before surrounding smaller plants and covers are placed. Position trees as shown on plans or, where spacing dimensions or locations are not clear, as approved.

Plant shrubs on centers as shown on plans with spacing adjusted if required to evenly fill bed using specified quantity of plants.

Plant hedges on centers as shown on plans. Excavate trenches a maximum of 4-inches deeper and 12-inches wider than spread of roots or diameter of balls. Make adjustments to spacing if necessary to fill trench evenly with the quantity of plants shown on plans.

Plant ground covers in beds having minimum 8-inchs of prepared soil mixture. Treat ground cover beds with soil fumigant, after preparation for planting but before any plants are installed within bed area, to destroy weed seeds. Apply according to manufacturer's directions, delaying planting for the recommended minimum period to allow dissipation of herbicide. Space plants as shown on plans. Mulch and water immediately after planting.

Plant bulbs in ground cover beds to recommended depths for each bulb type as shown on plans.

Provide trees and planting beds with 3-inch layer of fir or hemlock bark mulch within 2-days after planting and keep at this depth throughout maintenance period. Mulch to entirely cover area of saucer around each tree.

Use 4 guys equally spaced as shown on plans for all trees greater than 4-inches in diameter.

Use 3 guys equally spaced as shown on plans for all trees 4-inches in diameter or less.

Where shown on plans, wrap trunks of trees spirally from ground line to height of second branches. Make all wrappings neat and snug and hold material in place by raffia cord at top and bottom.

209.03.04D PRUNING AND REPAIR

At completion of planting work, prune and repair injuries to all plants. Limit amount of pruning to minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of planting operations. Do not change natural habit or shape of plant. Make cuts to branch collar leaving no stubs.

209.03.04E PLANT GUARANTEE

Guarantee all plants and trees for a minimum of 2-years to be alive and in vigorous growing condition at the end of the guarantee period. Guarantee period shall begin from the date of acceptance of work as described in **Subsection 103.16**. Remove unsatisfactory plants and replace with plants of the same kind, quality, and size as originally specified. Guarantee all plant replacements to be alive and in vigorous growing condition 2-years after replacement. Bear all costs of replacement except for replacements resulting from removal, loss or damage due to occupancy of project in any part, vandalism, or acts of neglect on the part of others. Replace plants that die immediately, unless during a season unfavorable for planting. When season is unfavorable, plant during the first month of the next favorable planting season.

209.03.04F MAINTENANCE

Begin maintenance immediately after each plant and tree is installed and continue to maintain until the end of the guarantee period.

Perform the following operations:

A. Watering as often as required to maintain capillary water within 2-inches of the soil surface around plants and trees;

B. Weeding of plant beds, planting saucers, and plant pockets to keep free of weeds by removing by hand, or by using approved selective herbicide according to the manufacturer's directions for use. Pre-emergent herbicides are prohibited in stormwater facilities; approved aquatic herbicides may be used from June 1 to September 30 and no herbicide application can occur from October 1 to May 31.

C. Mulching monthly to replenish mulch and keep at required 2-inch minimum depth;

D. Tightening and repairing guy wires to keep trees erect and supported without damage to bark;

E. Resetting plants or trees to proper grades or upright position;

F. Restoration of planting saucers;

G. Replace plants and trees required by the guarantee on a regular monthly basis during the planting season, which is between September 1 and March 31.

209.03.05 IRRIGATION SYSTEMS

209.03.05A GENERAL

Install components of the irrigation system as shown and as recommended by the equipment manufacturers. All sprinkler run-outs shall be evenly graded to the drain points shown on plans. Piping beneath paved areas and concrete walks shall be installed in PVC sleeves. Construct irrigation system in areas to receive topsoil after topsoil is spread, compacted, and rough graded. Bed PVC pipe in sand as shown on plans and backfill to a minimum of 3-inches above the pipe with sand. Determine the final number and location of sprinkler heads after grading is complete, such that complete coverage of all sprinkled areas is provided. Flush out system thoroughly and pressure test before installing sprinkler heads. Adjust flow on each head for proper coverage.

Repair and replace irrigation parts and winterize as necessary.

209.03.05B PVC PIPE

Cut, make up, and install PVC pipe in accordance with the manufacturer's recommendations, as approved. Lay PVC pipe using the practice of snaking from one side of the trench to the other, one cycle per 40-feet or less. Use strap wrenches for tightening threaded plastic joints. Take care not to over-tighten fittings. Do not lay PVC pipe when the temperature is below 40º F. Sprinklers and valves shall be installed in accordance with the manufacturer's recommendations, as approved.

209.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

209.04.01 INCIDENTAL BASIS

When not specified or shown as a separate pay item in the Schedule of Prices, payment for all landscape work is considered to be incidental to the construction.

209.04.02 UNIT PRICE BASIS

When so listed in the bid, payment for the landscaping items will be made on a unit price basis for the number of items actually placed and accepted.

209.04.03 LUMP SUM BASIS

When so listed in the bid, measurement and payment will be made at the contract lump sum pay item for landscaping, complete.

210 RESURFACING

210.01 DESCRIPTION

This section covers the work necessary to replace all pavement, pavement base, curbs, sidewalks, rock surfacing, and other surface features impacted either directly or indirectly by the operations related to the construction of wastewater systems, stormwater drainage systems, water distribution systems, and conduits.

210.02 MATERIALS

210.02.01 ASPHALT CONCRETE

Use hot mix asphalt concrete ½-inch Level 2 or 3 mix (as specified in the Standard Details) conforming to the requirements for hot mix asphalt concrete in **Section 605** and **Section 205**, unless otherwise specified.

210.02.02 PAVEMENT BASE

Use pavement base material for resurfacing trenches that conform to **Section 603**.

210.02.03 FORMS

All forms shall conform to requirements for forms in **Section 208**.

210.02.04 ROCK SURFACING

Rock surfacing shall be 1½" or 1"– 0" crushed aggregate as specified in **Subsection 206.02.05A**.

210.02.05 SUBGRADE

Subgrade material shall conform to the requirements for subgrade in **Section 601**.

210.03 CONSTRUCTION

210.03.01 STREET MAINTENANCE

Maintain all trenches as specified under **Section 206**.

210.03.02 Temporary Hot or Cold Mix Asphalt

Unless steel plates are approved, all excavations on hard surfaces shall be paved with a temporary hot or cold mix asphalt patch at the end of each workday.

Place and compact temporary hot or cold mix asphalt to a minimum depth of 2-inches over the backfilled and compacted trench areas as specified under **Section 206**. Spread with a mechanical spreading machine or place by hand methods. Distribute into place by means of shovel, or suitable forks, and spread with rakes in a loose layer of uniform density.

After spreading, the mixture shall be thoroughly and uniformly compacted with a power-driven roller capable of providing compression of 200 to 300 pounds per linear inch as soon as raking is complete. Compact areas inaccessible to the roller by tamping. After compaction, the temporary asphalt shall have the minimum thickness specified and shall match the adjacent existing grade. The temporary asphalt patch shall be maintained such that a continuous surface will exist without depressions or potholes.

210.03.03 Pavement Base

Place pavement base to the specified depth; when not specified, place to a compacted depth of 12-inches. Bring the top of the pavement base to a smooth, even grade at a distance below finished grade equivalent to the required pavement depth.

Compact the pavement base with mechanical vibratory or impact tampers to a density of not less than 95% of the maximum dry density as determined by ASTM D1557.

210.03.04 Asphalt Concrete Pavement

210.03.04A Tack Coat

Tack coat shall be applied in accordance with **Subsection 605.03.04**.

210.03.04B Asphalt Concrete Placement

Sawcut the existing pavement a minimum of 6-inches from the edge of the existing pavement at the side of the trench. The sawcut shall be a straight line and shall follow lines parallel to the pipe centerline to remove any pavement that has been damaged or that is broken and unsound. The sawcut pavement edges shall be free of irregularities. Provide a smooth, sound edge for joining the new pavement. Asphaltic concrete placement must also comply with requirements of **Subsection 206.03.10B**.

Place the asphalt concrete on the prepared subgrade over the trench to the specified depth, or the depth of the adjacent pavement, whichever is greater. When a prime coat is specified, place asphalt concrete after the prime coat has set. Maximum thickness for any one lift of pavement shall not exceed 3-inches when compacted. The minimum thickness for placement of compacted pavement shall not be less than twice the nominal maximum aggregate size. Spread and level the asphalt concrete with hand tools or by use of a mechanical spreader, depending upon the area to be paved. Bring the asphalt concrete to the proper grade and compact by rolling or the use of hand tampers where rolling is impossible or impractical.

If the existing asphaltic concrete being replaced is pervious asphalt, it must be replaced in kind.

Roll with power rollers capable of providing compression of 200 to 300 pounds per linear inch. Begin the rolling from the outside edge of the replacement progressing toward the existing surfacing, lapping the existing surface at least half the width of the roller. If existing surfacing bounds both edges of the replacement, begin rolling at the edges of the replacement,

lapping the existing surfacing at least half the width of the roller, and progress toward the center of the replacement area. Overlap each preceding track by at least half the width of the roller and make sufficient passes over the entire area to remove all roller marks and to produce a smooth, uniform surface. Density requirements for asphalt concrete pavement shall conform to those in **Subsection 605.03.15**.

Finished surface of the new, compacted paving shall be flush with the existing surface and conform to the grade and crown of the adjacent pavement.

210.03.04C CRACK SEAL

Immediately after the new paving is completed, apply poured joint filler, conforming to **Subsection 205.02.10D**, to all joints between the new and original asphalt pavement. The joint filler shall be centered on the joint, so that it completely covers the joint and a minimum of 3-inches in width.

Before opening the street to traffic, the Contractor shall verify that the crack seal is entirely dried or use a manufacturer approved detackifier.

210.03.04D PAVEMENT SMOOTHNESS

Pavement smoothness must comply with requirements of **Subsection 605.03.20**.

210.03.04E WEATHER LIMITATIONS

Weather limitations must conform to requirements of **Subsection 605.03.12**.

210.03.04F PROTECTION OF STRUCTURES

Provide whatever protective coverings may be necessary to protect the exposed portions of bridges, culverts, curbs, gutters, posts, guard fences, road signs, and any other structures from splashing oil and asphalt from the surfacing operations. Remove any oil, asphalt, dirt, or any other undesirable matter that may come upon these structures by reason of the surfacing operations.

Where existing structures (e.g., water valve boxes, manholes, catch basins, or other underground utility appurtenances) are within the area to be surfaced, make the resurfacing level with the top of the existing finished elevation of these facilities. The Contractor shall be responsible for adjusting the existing structures as specified in **Section 610**. Consider any delays experienced from such obstructions as incidental to the paving operation. No additional payment will be made. Protect all covers during asphalt application.

210.03.04G EXCESS MATERIALS

Dispose of all excess materials. Make arrangements for the disposal and bear all costs or retain any profit incidental to such disposal.

210.03.05 PORTLAND CEMENT CONCRETE PAVEMENT

Pavement replaced shall be the same thickness as that removed, or a minimum of 6-inches, unless otherwise specified. Protect the newly placed concrete from traffic for a period of at least 7-days.

Sawcut the existing pavement a minimum of 6-inches from the edge of the existing pavement at the side of the trench. The sawcut shall be a straight line following lines parallel to the pipe centerline, and shall remove any pavement that has been damaged or that is broken and unsound. The sawcut pavement edges shall be free of irregularities. Provide a smooth, sound edge for joining the new pavement.

If the existing pavement being replaced is pervious concrete, it must be replaced in kind.

Handle, place, finish, and cure concrete pavement in conformance with the applicable provisions of **Section 606**.

210.03.06 Rock Surfacing

Place rock surfacing only where shown or directed on streets, driveways, parking areas, street shoulders, and other areas disturbed by the construction. Spread the rock by tailgating and supplement by hand labor where necessary. Level and grade the rock surfacing to conform to adjacent existing grades and surfaces as directed.

210.03.07 Concrete Driveways, Sidewalks, and Curbs

Replace concrete driveways, sidewalks and curbs to the same section, width, depth, line, and grade as that removed or damaged. If the existing concrete being replaced is pervious concrete, it must be replaced in kind. Saw broken or jagged ends of existing concrete on a straight line and to a vertical plane. Prior to replacing the concrete sections, properly backfill and compact the backfill to prevent subsequent settlement.

Replace concrete driveways and sidewalks between scored joints unless otherwise directed by the Engineer. Provide a minimum 2-inch thick compacted leveling course of clean 1”-0” or ¾”– 0” crushed aggregate. All concrete replacement work shall be completed prior to the placement of adjacent asphalt concrete. Restoration and clean up shall be as specified under **Section 211**.

Construct forms to match existing. Place concrete and finish exposed surfaces similar to adjacent surface in conformance with **Section 607**.

210.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

210.04.01 Temporary Hot or Cold Mix Asphalt

Payment for temporary hot or cold mix asphalt pavement placed in all paved areas to be maintained over trench backfill shall be based on the unit price per linear foot stated in the Schedule of Prices.

The unit price will include all work and materials required to place and maintain the surface. If not included in the Schedule of Prices, then it will be considered incidental to the work and included in the unit price for pavement replacement.

210.04.02 Rock Surfacing

Payment for replacement of rock surfacing shall be based on the unit price per ton or cubic yard as stated in the Schedule of Prices. The quantity of rock replaced shall be the actual number of tons or cubic yards used as directed by the Engineer and shall be based on weight tickets from state certified weigh stations. The Contractor shall supply certified conversion factors to get from ton to cubic yard. Trip tickets shall be presented to the Inspector on the date of delivery. No payment will be allowed on trip tickets not so provided. The unit price for the rock shall include payment for excavating to provide space for the rock if necessary and disposal of all excess excavated material.

210.04.03 Asphalt Concrete and Portland Cement Pavement Replacement

Payment for asphalt concrete and portland cement concrete pavement used for resurfacing will be based on the unit price per lineal foot stated in the Schedule of Prices for each. All other asphalt concrete or portland cement concrete applications shall be paid for per **Subsection 605.04 or 606.04**.

The unit prices shall include payment for excavation and dig-out required to provide space for the surfacing and compacted crushed rock, preparation of the trench, surfacing, disposal of all excess excavated materials, temporary hot or cold mix asphalt (if not a separate pay item), and all other work required to complete the resurfacing. The crushed rock base and leveling course, crushed rock for the dig-out area, crack seal and seal coat will also be considered as included in the bid price for pavement replacement as stated in the Schedule of Prices.

210.04.04 Sidewalk and Driveway Replacement

Payment for sidewalk and driveway replacement will be based on the unit price bid per square foot, as stated in the Schedule of Prices. No differentiation will be made between concrete and asphalt sidewalks. All sidewalks and driveways damaged outside of 3-feet of the pipe centerline shall be replaced at the expense of the Contractor.

The leveling course will be considered as included in the bid price for sidewalk and driveway replacement, as stated in the Schedule of Prices.

210.04.05 Curb Replacement

Payment for replacing concrete curbs, curb and gutter, or gutter sections shall be based on the unit price bid per linear foot as stated in the Schedule of Prices. All curbs damaged outside of three feet of the pipe centerline shall be replaced at the expense of the Contractor.

No differentiation for payment will be made between curb and monolithic curb and gutter sections.

210.04.06 Removal and Replacement of Culverts, Stormwater Lines, or Catch Basins

Payment for the removal and replacement of existing culverts or stormwater lines lying parallel to and within 3-feet of pipe centerline will be based on the unit price per linear foot, irrespective of size, as stated in the Schedule of Prices. Payment shall be considered to include full compensation for all work and material required to remove and replace the pipe and restore the culvert or stormwater line to at least its original condition and function. Replacement of existing culvert headwalls will also be included in this payment.

Payment for removal and replacement of catch basins will be based on the unit price for each, regardless of size or shape, as stated in the Schedule of Prices. Payment shall be considered to include full compensation for all work required to remove and replace the catch basins and restore the basins to their original condition and intended function.

211 Restoration and Cleanup

211.01 Description

This section covers the work necessary to restore and clean up the site and remove all construction equipment, refuse, and unused materials of any kind resulting from project activities.

211.02 Materials

Provide all materials required to accomplish the work as specified.

211.03 CONSTRUCTION

211.03.01 SURFACE DRESSING

Slopes, sidewalk areas, planting areas, and roadway shall be smoothed and dressed to the required cross section and grade by means of a grading machine, insofar as it is possible to do, without damaging the work or existing improvements, trees, and shrubs. Unless specified otherwise, the maximum slope shall be 2 to 1 in cut and fill. Supplement machine dressing by hand work as necessary.

Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. Grade all areas true to line and grade as shown. Excavated areas adjoining new walkways and curbs shall be backfilled with topsoil. Where the existing ground is below the sidewalk and curb, fill and dress the area to the walk. Wherever fill material is required in the planting area, make finish surface high enough to allow for final settlement. Surface improvements, other than topsoil, which are adjacent to new walkways or curbs, such as asphalt paving or brickwork, shall be replaced with like materials.

211.03.02 REMOVAL OF MATERIALS

Remove and dispose of all excavated or construction materials, equipment, and trash of all kinds resulting from the work. Where brush and trees have been disturbed, remove and dispose of or restore same as directed by the Engineer at the Contractor's expense.

211.03.03 CLEANING DRAINS

Clean all drainage facilities such as inlets, catch basins, culverts, and open ditches of all excess material or debris that is the result of the work.

211.03.04 CLEANING PAVED SURFACES AND APPURTENANCES

Clean all pavement surfaces, whether new or existing, within the limits of the project. All haul routes will be kept free of dust, dirt, gravel, and debris at all times. Clean all existing improvements, including but not limited to, curbs, gutters, walls, sidewalks, lamp poles, vaults, signs, and castings for manholes, monuments, and water valves.

Sweep the street with a vacuum sweeper and hand broom all sidewalks.

211.03.05 RESTORING PLANTED AREAS

Hand-rake and drag all former grasses and/or planted areas leaving disturbed areas free from rocks, gravel, clay, or any other foreign material and ready, in all respects, for seeding. The finished surface shall conform to the original surface, be free-draining and free from holes, rough spots, or other surface features detrimental to a seeded area.

211.03.06 RESTORING MOBILIZATION, BORROW, AND DISPOSAL AREAS

Clean all properties that were disturbed during construction of the project. Dispose of all uprooted stumps, felled trees, brush, excess excavation, rock, discarded materials, rubbish, and debris. Remove all plants, equipment, tools, and supplies and restore the property to a neat, clean, and orderly condition in equal or better condition to that existing before move in.

211.03.07 REMOVAL OF SIGNS

Do not remove warning, regulatory, guide, or project signs prior to formal acceptance except as directed.

211.03.08 Restoring Curbs, Sidewalks, and Driveways

Repair or replace all curbs, sidewalks, driveways, and other structures damaged during construction of the work. Construct curbs, sidewalks, driveways, and other structures in conformance with the applicable requirements in **Chapter 600 – TRANSPORTATION TECHNICAL REQUIREMENTS**.

211.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

211.04.01 Lump Sum Basis

When restoration and cleanup is listed as a separate pay item on the Schedule of Prices, it will be paid for on a lump sum basis.

211.04.02 Incidental Basis

When not listed in the Schedule of Prices for separate payment, all restoration and cleanup will be considered incidental work for which no separate payment will be made.

End of Chapter

CHAPTER 300 - WASTEWATER TECHNICAL REQUIREMENTS

301 PIPES AND FITTINGS

301.01 DESCRIPTION

This section covers the following work:

A. Gravity and pressure sanitary sewer pipe

B. Fittings

C. Sanitary sewer laterals

301.02 MATERIALS

301.02.01 GENERAL

Use all sewer pipe and fittings of the size, strength, material, and joint type specified on the drawings and/or in the Proposal. Use jointing material as hereinafter specified for each pipe material. Each piece of pipe shall be clearly identified as to strength, class, and date of manufacture. The manufacturer or fabricator shall furnish appropriate certification, based on manufacturer's routine quality control tests, that the materials in the pipe and fittings meet the requirements specified herein. Strength, permeability, hydrostatic tests, and pipe joints will be used as the basis of acceptance as described under **Subsection 301.03.11**. Minimum length of pipe shall be 3½-feet.

Use pipe and fittings for sanitary sewer laterals of like material throughout; no interchanging of pipe and fittings will be allowed.

Provide tee or wye fittings in the sanitary sewer main for sanitary sewer laterals. Tees and wyes for sanitary sewer laterals shall be a minimum of 4-inches nominal diameter. All fittings shall be of sufficient strength to withstand all handling and load stresses encountered. All fittings shall be of the same materials as the pipe. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface. Use the same type of joints on all fittings that are used on the sanitary sewer main. Tee or wye fittings shall not be closer than 18-inches to any joint or bell of main line sanitary sewer.

Do not coat pipes for sewers, internally or externally, with any substance of any type in an attempt to improve its performance when tested.

Only lubricants for jointing materials approved by the manufacturer shall be used.

Furnish to the Project Manager a certified statement from the manufacturer of the gaskets, setting forth the basic polymer used in the gaskets, and results of the tests of the physical properties of the compound. Gaskets shall be shipped in containers with identification of the batch from which the gaskets were fabricated.

301.02.02 REINFORCED CONCRETE PIPE

Reinforced concrete pipe shall conform to ASTM C76 minimum Class III, as shown or specified, with Wall B design and the following additional requirements:

A. Cement shall be Type II or Type III conforming to ASTM C150.

B. The minimum Portland Cement content shall be 564 pounds per cubic yard.

C. The water/cement ratio shall not exceed 0.49.

D. Elliptically reinforcing is not permitted.

E. The Contractor shall provide the Project Manager with proof of compliance from the pipe manufacturer that the pipe and concrete mix conforms in all respects to these specifications and other non-conflicting requirements of the referenced ASTM specifications.

301.02.02A JOINTS FOR REINFORCED CONCRETE PIPE

Use rubber gaskets for bell and spigot pipe conforming to ASTM C443 except as modified herein.

Use captive gasket in groove design for pipe 24-inches in diameter and larger.

Use only lubricants for jointing materials approved by the manufacturer.

The following specification is for all concrete sewer pipe with a nominal inside diameter equal to or greater than 24-inches:

A. General – The joint assemblies shall be so formed and manufactured that when the pipe is drawn together in the trenches, the pipe shall form a continuous watertight conduit with a smooth and uniform interior surface and shall provide for slight movements of any pipe in the pipeline due to expansion, contraction, settlement, or lateral displacement. The rubber gasket shall be the sole element of the joint depended upon to provide water tightness. The ends of the pipe shall be in planes at right angles to the longitudinal centerline of the pipe, except where bevel-end pipe for deflections up to 5º is specified or indicated for bends. Joint faces shall be finished to regular, smooth surface and shall have all surface points within ¼-inch of a theoretical plane taken normal to the pipe axis.

B. Design – The joint design shall be similar to that shown on **Standard Details 310 or 311, Joint Detail Reinforced Concrete**. The shape and dimensions of the joint shall be such as to provide the following minimum requirements:

(1) The rubber gaskets shall be solid gaskets of circular cross section.

(2) The gasket shall be confined in a groove in the spigot end of the pipe so that movement of the pipe or hydrostatic pressure cannot displace the gasket. When the joint is assembled, the gasket shall be compressed to form a watertight seal.

(3) The volume of the annular space provided for the gasket, with the engaged joint in normal joint closure in concentric position, shall not be less than the design volume of the gasket given on **Standard Detail 312, Typical Joint Detail and Data Form,** supplied by the Engineer of Record and approved by the Engineer. The cross-sectional area of the annular space shall be calculated for minimum bell diameter, maximum spigot diameter, minimum width of groove at surface of spigot, and minimum depth of groove. The volume of the annular space shall be calculated considering the centroid of the cross-sectional area to be at the midpoint between the inside bell surface and the surface of the groove on which the gasket is seated at the centerline of the groove.

(4) Each gasket shall be manufactured to provide the design volume of rubber required by the joint design used and within a tolerance of ±3% for gaskets up

to and including ½-inch diameter and ±1% for gaskets of 1-inch diameter and larger. The allowable percent tolerance shall vary linearly between ±3% and ±1% for gasket diameters between ½-inch and 1-inch.

(5) The tolerances permitted in the construction of the joint shall be those stated for joint design on the approved **Typical Joint Detail and Data Form, Standard Detail 312**.

(6) The taper on all surfaces on the bells and/or spigots on which the rubber gaskets may bear during closure of the joint and at any degree of partial closure, except within the gasket groove, shall not exceed 2º.

The Engineer will utilize the joint data to determine an acceptable joint gap for the particular joint design submitted. The gap will be established by subtracting the settlement allowance, from the following table, from the total distance over which the joint may be pulled while meeting the provisions of this specification, or shall be equal to 1½-inches, whichever is smaller.

The surfaces of the bell and spigot in contact with the gasket and adjacent surfaces that may come in contact with the gasket within the specified joint movement range, shall be free from defects.

Table 301.02.02A-1 SETTLEMENT ALLOWANCE

PIPE INSIDE DIAMETER (Inches)	SETTLEMENT ALLOWANCE (Inches)
30 or less	⅜
36	½
42	½
48	⅝
54	⅝
60	¾
66	¾
72	⅞
84 or more	1

(7) The inside surface of the bell adjacent to the bell face shall be flared to facilitate joining the pipe sections without damaging or displacing the gasket.

(8) In all pipes 36-inches or more in diameter, the bell and the spigot of the joint shall contain both circumferential and longitudinal reinforcement. For double-cage pipe, the reinforcement shall be at least equal in area to that of the outside cage or line for bells and the inside cage of line for spigots. For single-cage pipe, the reinforcement shall be at least equal in area to that of the cage for the bell and the spigot. The location of reinforcement shall be subject, however, to the permissible variations in dimensions given in the "position of reinforcement" sections in the appropriate ASTM Standard Specification (C76, C655, etc.)

C. Approval of Joints – A detail showing exact dimensions of the joint and diameter of rubber gaskets, including tolerances, and details of the spigot groove, and other required data shall be submitted to the Engineer for approval on the **Typical Joint Detail and Data Form, Standard Detail 312**. Data must be submitted on City's form.

Any fabrication or procurement of material performed prior to approval of details shall be at the Contractor's risk. Approval of the pipe details by the Engineer shall not relieve the Contractor of any of his responsibility to meet all the requirements of these specifications or of the responsibility for the correctness of the pipe details.

Should a joint gap in the completed sewer line exceed that permissible or should visible leakage exist at the joint, a reinforced concrete closure collar shall be constructed around the joint or the joint shall be re-laid as directed by the Engineer at the Contractor's expense.

Responsibility for checking pipe dimensions and any problems arising there from is the Contractor's.

D. Material for Rubber Gaskets

(1) Composition and Properties – The term "rubber gaskets" as used in these Specifications shall be construed to include natural rubber or synthetic rubber compound. Rubber gaskets shall be extruded or molded and cured in such a manner that any cross-section will be dense, homogeneous, and free from porosity, blisters, pitting, and other imperfections. The gaskets shall be extruded or molded to the design cross-section diameter shown on the approved **Typical Joint Detail and Data Form, Standard Detail 312**, within a tolerance of ± 1/64-inches or ± 1.5% of the diameter, whichever is the larger. The gaskets shall be fabricated from an elastomeric compound having the following physical properties:

Table 301.02.02A-2 GASKET PROPERTIES	
Tensile strength, PSI, minimum	1,200
Elongation at break, percent, minimum	350
Shore durometer hardness, Type A	35 to 65
Compression set (constant deflection) Percent of original deflection, maximum	25
Change in weight, water immersion, percent Maximum (2 days at 158º F)	10
Accelerated aging, oxygen pressure test (48 hours, 158º F, 300psi) or air oven test (96 hours, 158º F): Tensile strength after aging, percent of original, minimum	85

(2) Storage – All gaskets shall be stored in as cool a place as practicable, preferably at 70º F or less, and protected from the direct rays of the sun. Gaskets that show evidence of deterioration and other defects, such as surface checking or cracking, will be rejected.

(3) Compound Tests

(a) Methods of Test – Laboratory tests to determine the physical properties of the rubber gaskets to be furnished under this specification shall be performed on test specimens taken from the finished rubber product; except that, at the option of the pipe manufacturer with the approval of the Engineer, specimens may be furnished in accordance with the appropriate ASTM method:

(i) Tensile Strength and Elongation – ASTM D412.

(ii) Hardness – ASTM D2240 (with the exception of Section 3). The determination shall be taken directly on the gasket. The presser foot shall be applied on areas that are ¼-inch or greater in thickness. If a sample ¼-inch or greater in thickness is not available in the gasket, thinner samples may be piled up to obtain this thickness.

(iii) Compression Set – Method B of ASTM D395. The specimens shall be a ½-inch long section of gasket with a minimum diameter of ½-inch, deflected axially. Test conditions shall be 22-hours at 158º F (70º C).

(iv) Accelerated Aging – ASTM D573. Test conditions shall be 96-hours at 158º F (70º C).

(v) Water Absorption – ASTM D471. Use distilled water for the standard test liquid. When a 1-inch wide test specimen cannot be obtained, use the greatest width obtainable from the test sample. Test conditions shall be 48-hours at 158º F (70º C).

(vi) Splices – If a splice is made in the fabrication of the gasket, the strength shall be such that the gasket shall withstand 100% elongation over the part of the gasket that includes the splice with no visible separation of the splice. While in the stretched position, the gasket shall be rotated in the spliced area a minimum of 180º in each direction in order to inspect for separation. Any portion of the splice shall be capable of passing a bend test without visible separation. The bend test of circular gaskets is defined as wrapping the portion of the un-stretched gasket containing the splice a minimum of 180º and a maximum of 270º around a rod of a diameter equal to the cross-section of the gasket.

(b) Test Reports – The manufacturer shall, if required, furnish certified copies of the test reports of the rubber compound used in all rubber gaskets.

301.02.02B FITTINGS FOR CONCRETE PIPE

Use only shop fabricated fittings on all concrete pipes.

Submit fabrication details to the Project Manager for shop-fabricated fittings for review prior to delivery of fittings to the job site.

301.02.03 DUCTILE IRON PIPE

Ductile iron pipe shall be Class 52 or greater, shall be centrifugally cast of 60 42 10 iron, and shall conform to ANSI/AWWA C151/A21.51. Joints shall normally be push on, or mechanical joint, conforming to ANSI/AWWA C111/A21.11. If specified and approved by the Engineer in writing, flanged pipe may be used and shall conform to ANSI/AWWA C115/A21.15.

Ductile iron pipe shall be lined with cement mortar and seal-coated in accordance with ANSI/AWWA C104/A21.4.

301.02.03A JOINTS FOR DUCTILE IRON PIPE

Rubber gaskets shall conform to ANSI/AWWA C111/A21.11.

301.02.03B FITTINGS FOR DUCTILE IRON PIPE

Use mechanical-joint, cast-iron fittings conforming to ANSI A21.10/AWWA C110, and a class of at least equal to that of the adjacent pipe. Use push-on fittings of gray cast iron with body

thickness and radii of curvature conforming to ANSI A21.10 and joints conforming to ANSI A21.11/AWWA C111.

301.02.04 Polyvinyl Chloride (PVC) Pipe

All PVC pipe and fittings shall conform to ASTM D3034 SDR 35 and ASTM F679 standards.

Where required for added strength or pressure systems, AWWA C900 or C905 may be used.

The Contractor shall use the same material for all pipes and fittings for both the sewer mainline and any service connections between consecutive manholes. Pipe bedding for PVC pipe shall be in accordance with **Section 206**.

301.02.04A Joints for PVC Pipe

Joints shall be bell and spigot joints with a rubber gasket conforming to ASTM D3212 and ASTM F477. Additives and fillers, including but not limited to, stabilizers, antioxidants, lubricants, etc., shall not exceed 10 parts per 100 by weight.

301.02.04B Fittings for Polyvinyl Chloride (PVC) Pipe

PVC fittings shall be in conformance with the requirements of ASTM D3034 SDR 35 and ASTM F679 as applicable.

PVC pipe shall be connected to sanitary sewer manholes using an approved manhole adapter specifically manufactured for the intended service. PVC pipe manhole adapters shall be Kor-N-Seal or approved equal commercial product. Field fabricated waterstops or improvised adapters such as gaskets stretched over the pipe will not be allowed.

Manhole adapters requiring the use of grout for installation, such as sand collars, shall be bonded, anchored, and finished using an approved non-shrink grout as specified in **Subsection 205.02.07C.** Plain Portland Cement mortar is not acceptable. Sand collars shall be fabricated by an approved manufacturer and not field made. Sand collars shall be coated with an epoxy adhesive compatible with both PVC and concrete grout and coated with aggregate. The installation of the sand collar shall be such that the bell portion of the adapter is adjacent and external to the wall of the manhole, and the spigot shall protrude through and into the manhole 3-inches beyond the interior of the wall of the manhole.

301.02.04C Fittings for PVC Pressure Pipe

PVC pressure pipe fittings shall conform to AWWA C900 Class 100 for pipe diameters 4-inches to 12-inches and AWWA C905 DR 51 for pipe diameters 14-inches and above.

301.02.04D Coupling Adapters for PVC Pipe

Rigid couplers (solid sleeves) manufactured to couple PVC pipe will be required when connecting PVC pipe. When rigid couplers cannot be used, use flexible mechanical compression joint coupling with No. 305 stainless steel bands such as Fernco, Calder, or approved equal.

301.02.05 High Density Polyethylene (HDPE) Pipe, Solid Wall

Use pipe made from premium high-density polyethylene resin qualified as Type III, Category 5, Class C, Grade P34 as specified in ASTM D1238. This material shall have a long-term hydrostatic strength of 1,600psi when tested and analyzed in accordance with ASTM D2837 and shall be listed by the Plastic Pipe Institute as a PE 3408 resin. Pipe sizing is to be according to ASTM F714 and ASTM D3035 and shall be SDR17 or SDR26, as necessary.

The minimum engineering design properties shall be:

Table 301.02.05 HDPE DESIGN PROPERTIES		
Tensile Strength Yield	ASTM D638 (2”/min.)	3,200psi
Elongation at Break	ASTM D638	750%
Modulus of Elasticity	ASTM D638	105,000psi
Flexural Modulus	ASTM D3350	124,000psi
Environmental Stress Crack Resistance, Condition C	ASTM D1693	F_{20} at >5,000 hrs.
Long-term Hydrostatic Strength @ 73.4º F	ASTM D2837	1,600psi

The pipe shall contain no recycled compound except that generated in the manufacturer’s own plant from resin of the same specification from the same raw material supplier.

The polyethylene pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be uniform in color, opacity, density, and other physical properties. The raw material shall contain a minimum of 2%, well dispersed, carbon black. Additives that can be conclusively proven not to be detrimental to the pipe may be also used, provided the pipe produced meets the requirements of this standard.

The following information shall be continuously marked on the pipe or spaced at intervals not exceeding 5-feet:

A. Name and/or trademark of the pipe manufacturer

B. Nominal pipe size

C. Standard dimensional ratio (SDR)

D. The letters “PE” followed by the polyethylene grade per ASTM D3350, followed by the hydrostatic design basis in 100’s of PSI, e.g., PE 3408

E. Manufacturing standard reference, e.g., ASTM F714

F. A production code from which the date and place of manufacture can be determined

Compliance with requirements of these specifications shall be certified in writing by the pipe supplier.

Tee and wye fittings to connect sanitary sewer laterals shall be either molded butt fusion fittings, or molded saddle fusion fittings. Connections to manholes shall be made with approved, cast-in-place, gasketed adapters or other approved equal.

301.02.05A JOINTS FOR HDPE PIPE

High-density polyethylene (HDPE) pipe and fittings shall be jointed by the thermal butt fusion per ASTM F2620 and the manufacturer’s specific recommendations or approved coupler. The temperature of the heater plate should be 400º F – 450º F. Of additional importance are the interface pressures. The tensile strength at yield of the butt fusion joints shall be not less than that of the pipe.

The HDPE pipe may be adapted to fittings or other systems by means of an assembly consisting of an HDPE stub-end, butt-fused to the pipe, a backup flange of ductile iron made to Class 150, ANSI B1 6.1/B1 6.5 dimensional standards with exceptions, bolts of comparable material, and a gasket of suitable neoprene, red rubber or non-asbestos rubber compound cut to fit the joint. In all cases, the bolts shall be drawn up evenly and in line.

HDPE pipes of the same outside diameter but different wall thickness shall be joined by means of a flange assembly as designated above or by thermal butt fusion and will only be allowed when expressly approved by the Engineer.

The pipe supplier shall be consulted to obtain machinery and expertise for the joining by butt fusion of HDPE pipe and fittings. No pipe or fittings shall be joined by fusion by any Contractor until he is qualified in the techniques involved.

301.02.05B FITTINGS FOR HDPE PIPE

The pipe used to fabricate fittings shall comply with AWWA C906 and ASTM D1248 requirements for Type III, Class C, Category 5, Grade P34 polyethylene material. Standard fittings and special fittings shall be manufactured from the same class of material as the pipe and be fully compatible.

Fittings shall be manufactured in accordance with ASTM D3261. Fabricated fittings shall be pressure-rated to match the system piping. HDPE electrofusion fittings, or equivalent, shall conform to ASTM F1055.

301.02.05C COUPLINGS FOR HDPE PIPE

Mechanical connections of polyethylene pipe to fittings or other materials shall be by means of flanged connections (flanged coupling adapters and ANSI backup rings rated for the same pressure service as the system piping) or flexible couplings designed for joining polyethylene pipe to polyethylene pipe or to another piping material such as a head PVC coupler as applicable, as approved by the Engineer. Flanged joints shall use bolts of compatible material. Gaskets shall be required when joining to non-polyethylene materials. In all cases, the bolts shall be evenly torqued using a crisscross pattern like the one used to tighten lug nuts on a car wheel. Flanged joints are to be re-torqued after one-hour or more has passed since initial torquing.

301.02.06 SERVICE CONNECTION MARKERS

Service connection markers shall be new 2-inch x 4-inch utility grade lumber, or better, and one piece shall be used. No splicing will be permitted.

301.02.07 CLEANOUTS

Cleanouts shall be of the same material and size as the line it is serving or shall be 8-inch nominal diameter, whichever is smaller.

301.03 CONSTRUCTION

301.03.01 EXCAVATION AND BACKFILL

Excavation and backfill shall conform to the requirements of **Section 206** as further specified herein.

301.03.01A EXCAVATION

All excavation shall be unclassified unless otherwise specified.

301.03.01B BACKFILL

301.03.01B1 Off-road Trench Backfill

For public pipe installations outside of dedicated street rights-of-way, or where current or future hard-surfaced improvements shall not be made, native backfill material as specified in **Subsection 206.02.04** for use above the pipe zone may be used.

301.03.01B2 Traffic Area Trench Backfill

For public pipe installations within dedicated street rights-of-way or where current or future hard-surfaced improvements shall be made, select backfill material as specified in **Subsection 206.02.05A**, for crushed gravel, or as specified in **Subsection 206.02.05B**, for controlled low-strength material, shall be used.

301.03.02 Line and Grade for Gravity and Pressure Sanitary Sewers

Do not deviate from the line or grade, as established by the Engineer of Record, more than ½-inch for line and ¼-inch for grade, provided that such variation does not result in a level or reverse sloping invert. Measure for grade at the pipe invert, not at the top of the pipe, because of permissible variation in pipe wall thickness.

Establish line and grade for pipe by the use of pipe lasers and the Contractor shall check the line and cut from the offset stakes at maximum intervals of 50-feet.

301.03.02A Line and Grade for Sanitary Sewer Laterals

The Engineer will establish line and grade to the tract of land to be serviced by the wastewater system. At the pre-selected location of the sanitary sewer lateral, a stake will be driven into the ground showing the depth of excavation required at the property line.

Lay the pipe on a straight line and at a 2% grade between the tee or riser and the stake. Lay the pipe by means of a builder's level of good quality and not less than 24-inches in length.

301.03.03 Pipe Distribution and Handling

Distribute material on the job no faster than it can be used to good advantage. Unload pipe only by means recommended by the pipe manufacturer. Do not unload pipe by dropping it to the ground. For publicly financed improvement projects, do not distribute more than one week's supply of material in advance of laying, unless approved by the Project Manager.

Pipe shall not be unloaded or stored in the public right-of-way or easement unless it has been certified and accepted by the Engineer. Inspect all pipe and fittings prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are used. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

Use proper implements, tools, and facilities for the safe and proper protection of the work. Lower pipe into the trench in such a manner as to avoid any physical damage to the pipe. Remove all damaged pipes showing kinks, cracks, buckles, cuts, gouges or any other damage from the job site. Do not drop or dump pipe into trenches.

301.03.04 Pipe Laying and Jointing of Pipes and Fittings

301.03.04A General

Proceed with pipe laying upgrade with spigot ends pointing in direction of flow. Place pipe in such a manner as to ensure solid bearing between the pipe and the full cross-sectional area of the bedding for the full length of the pipe between joints. Make assembly of the joint in accordance with the recommendations of the manufacturer. Take care to properly align the pipe before forced entirely home. Upon completion of pipe laying, all pipe joints shall be in the "home" position, which is defined as the position where the least gap (if any) exists, when the pipe components that comprise the joint are fitted together as tightly as the approved joint design will permit. Joints with gaps exceeding the normal gap in the “home” position by more than ¼-inch shall be repaired as required by the Engineer at no cost to the City. In cases where gaps exist in joints

but do not exceed the normal gap in the “home” position by more than ¼-inch, the Engineer may require repair of the joint if, in his judgment, these detract from the integrity of the joint based upon soil conditions and the intended use of the pipeline.

After installation, prevent movement from any cause, including uplift or floating.

Take special care to prevent movement of the pipe after installation when laid within a movable trench shield.

When laying operations are not in progress, protect the open end of the pipe from entry of foreign material and block the pipe to prevent movement or creep of gasketed joints.

Plug off pipes that are stubbed out for manhole construction or for connection by others by use of a cap or Cherne (or approved equal) plug designed for that purpose. Such plugs or caps shall be removable, and their removal shall provide a bell end suitable for extension of the line.

Provide all rigid sewer pipes, 36-inches or smaller in diameter, entering or leaving manholes or other structures, with flexible joints within 18-inches of the exterior wall. Rigid pipes larger than 36-inches in diameter shall have this flexible joint within a distance from the exterior wall equal to one-half the nominal pipe diameter. If the flexible joint is in excess of the distance specified from the exterior wall, it will be concrete-bedded to the height of ¼ pipe inside diameter with a minimum of 6-inches and a maximum of 12-inches required beneath the pipe barrel. Length shall be from structure to back of pipe bell for incoming pipes and from structure to 6-inches from bell of the adjoining pipe for outgoing pipes. Also required will be a #4 rebar mat with three longitudinal bars minimum, cross tied on 12-inch centers beneath the pipe bell and extended into the structure wall or base or as required by the Engineer. All extra costs will be borne by the Contractor.

When cutting and/or machining of the pipe is necessary, use only tools and methods recommended by pipe manufacturer.

When 3 or more joint gaps exceed the permissible distance as described herein before, or when 3 or more corrections of defective work are necessary between 2 structures, then all pipe between the first and last defect shall be properly re-laid to reduce the total repairs to 2 per structure-to-structure section. This will be done at the Contractor’s sole expense.

301.03.04B CONCRETE PIPE

Use rubber ring gasket joints unless mortar joints are specified by the Engineer. When mortared joints are specified, the entire joint for the full circumference of the pipe shall be completely filled with mortar. The surfaces of the pipe joint shall be brushed clean prior to mortaring. Fill the exterior of the joint with mortar and in the case of bell and spigot joints, fill to an angle of 45º.

301.03.04C POLYVINYL CHLORIDE (PVC) PIPE

The Contractor shall use the same material for all pipe and fittings for both mainline and sanitary sewer laterals between two consecutive manholes, unless otherwise approved by the Engineer.

Connections to manholes shall be made by an approved manhole adapter that is grouted into the manhole wall or poured in place with the manhole base. If the joint at the coupling meets the requirement of a flexible joint as determined by the Engineer, no additional flexible joint within 18-inches of the manhole wall will be required.

Sanitary sewer laterals shall be connected to mainline PVC sanitary sewer pipe with full-line tees or wyes and ⅛ bends.

301.03.04D HIGH DENSITY POLYETHYLENE (HDPE) PIPE

Prior to placing the HDPE pipe, all joints shall be complete except as noted. The full length of each section of pipe shall rest solidly upon the pipe bed. Pipe that has the grade of the joint disturbed after laying shall be taken up and re-laid.

Pipe fusion shall be performed as recommended by the manufacturer and shall not be done in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joining is completed. When work is not in progress, the open ends of pipe and fittings shall be securely closed so that no trench water, earth, or other substance will enter the pipe or fittings. Pipe ends left for future connections shall be immediately plugged or capped.

HDPE pipe shall be brought to within 5º F of earth temperature prior to cutting to length for placement of tee, elbows, or other fittings.

HDPE pipe shall be joined by the thermal, butt-fusion method or other coupling methods specifically approved by the Engineer prior to installation.

Any jointing shall be only conducted by personnel possessing the qualifications and certifications specified herein. The joining sites shall be cleared and graded, if necessary, to provide enough space for pipe storage and fusion. The site shall be free of rocks, stumps, and other debris that could cut, scar, gouge, or otherwise damage the pipe. The Contractor shall provide a shelter over the joining operation during adverse weather conditions. Particular caution is required to prevent any water from coming in contact with the heater plate.

The Contractor shall be responsible to provide training and instruction for his personnel at no cost to the City. Training shall include, but not be limited to, familiarization with HDPE pipe and fittings, fusion, testing, and installation of pipe. The personnel requiring training includes, but is not limited to, quality control personnel and polyethylene fusion machine operators as applicable for the project. Only instructed personnel will be allowed to perform the installation or supervision of polyethylene fusion joints.

A listing of those authorized for polyethylene fusion work shall be submitted and approved by the Project Manager prior to any installation or work on the HDPE pipe.

The Contractor shall make all training sessions available to City Inspectors and other quality assurance personnel at no charge and shall schedule the training sessions at a date, place, and time agreeable to the Project Manager.

301.03.05 INSTALLATION OF SANITARY SEWER LATERALS, TEES, AND WYES

Install tee and wye fittings and sanitary sewer laterals as shown on the Standard Details. Use 4-inch diameter pipe for residential services or match existing building sewer size, whichever is greater. Provide pipe-bedding material, compacted to a minimum of 90% of maximum density as determined by ASTM D1557, under all tees, wyes, and branch fittings extending to the springline of the fittings. Place pipe bedding material on undisturbed native material or compacted foundation stabilization material.

Maximum vertical deflection permissible with any one fitting shall not exceed 45º. No horizontal deflection is allowed.

Provide ends of all sanitary sewer laterals and fittings with approved watertight plugs or caps suitably braced to prevent blow-off during internal air testing. Such plugs or caps shall be removable and their removal shall provide a socket suitable for making a flexible joint service connection or extension.

301.03.06 Service Connection Markers

After the sanitary sewer lateral is installed, block the capped or plugged end and install the 2-inch x 4-inch marker. Extend markers at least 24-inches above the ground surface. Green magnetic tape with “caution sewer line buried below” in red or black letters shall be laid 1-foot above the top of the sanitary sewer lateral from the main line then wrapped around the cap at the end of the service and brought to the surface wrapped around the 2-inch x 4-inch marker. Paint the top portion of the marker after its installation with first-quality, white, quick-drying enamel. After the paint has dried, use black, quick-drying enamel and neatly indicate the distance from the natural ground surface to the top of the sanitary sewer lateral in feet and inches. If curbs or curbs and gutters are present or to be poured as part of the project, stamp the top of the curb and gutter with an “S” over the sanitary sewer lateral crossing.

In cases where the sanitary sewer lateral is not perpendicular to the curb, in addition to the “S” stamp on the top of the curb at the crossing, an “S” shall be cut into the top of the curb at the location perpendicular to the end of the sanitary sewer lateral. The “S” cut into the top of the curb shall indicate the distance from the face of curb to the 2-inch x 4-inch marker.

Take precautions during the backfilling operation to ensure the position and location of the marker remain in place. If the marker is broken or knocked out of vertical alignment during the backfilling operation, reopen the trench and replace the marker.

301.03.07 Closure Collars

301.03.07A Concrete Coupling Closure Collars

Only install concrete closure collars where specified in the Contract Documents. Construct concrete closure collars in conformance with the details provided. Wash pipe to remove all loose material and soil from the surface on which the concrete will be placed. Wet pipe thoroughly prior to placing the collars. Construct forms with materials that will ensure that no concrete shall enter the line. Make entire collar in one placement and do not place collars in water. Concrete closure collars shall be placed using an approved commercial concrete bonding agent applied to all surfaces in contact with the collar. Where concrete closure collars are necessary to join PVC pipe, the PVC surface shall first be prepared for bonding to the concrete by applying a dense coating of clean mortar sand to the pipe using PVC solvent cement. After the cement has cured, commercial concrete bonding agent shall be applied to the sand surface prior to placement of concrete. Water as a substitute for commercial bonding agent will not be allowed. Do not backfill the trench until the concrete has sufficient strength.

301.03.07B Flexible Coupling Closure Collars

Use flexible coupling collars only when specified or approved. Couplings must incorporate full length and full diameter stainless steel shear bands. Couplings shall be of the type produced by Fernco, Mission, or approved equal.

301.03.08 Field Fabricated Connections

Field fabricate tees or wyes for required connections when shown or required. Make all field fabricated tees or wyes similar to approved, manufacturer-supplied tees or wyes and provide for a flexible joint at the point of connection to the tee or wye. Do not allow tee or wye to protrude past the inside wall surface of the sanitary sewer pipe, and finish the inside wall surface of the sanitary sewer pipe to provide a smooth surface for uninhibited flow through the pipe. Fabricate fittings by inserting a stub into a hole cut in the pipe and grout with a non-shrinking grout. Coat surfaces to receive grout with an epoxy bonding agent prior to grouting. Fabrication details for fittings shall be submitted to the Engineer for review prior to fabrication. Steel reinforcement may be required by the Engineer at no

expense to the City. Inserta Tee or approved equal may be used in lieu of field-fabricated connections if approved by the Engineer.

301.03.09 CLEANOUTS

Cleanouts will be constructed per the Standard Details. The cleanout will stand vertical and the Contractor will bring compacted bedding material up around the vertical portion of the top. Frames and covers shall comply with requirements of **Subsection 302.02.06**.

301.03.10 SERVICE RISERS

The service risers will be constructed with a tee fitting at the main line. If a wye fitting is necessary and approved, then a ⅛ bend will be utilized as part of the assembly replacing the tee. Risers will be avoided whenever possible. Risers less than 5-feet will not be allowed unless approved by the Engineer.

301.03.11 TESTING

301.03.11A GENERAL

All gravity sanitary sewers including sewer laterals and appurtenances shall successfully pass an air test prior to acceptance and shall be free of leakage.

Manholes shall be tested as specified in **Subsection 302.03.07**.

All pressure sanitary sewer force mains shall be tested in accordance with applicable portions of **Subsection 503.02.07**, when not otherwise specified.

Perform the tests in a manner satisfactory to the Engineer. Calibrate gauges for air testing with a standardized test gauge provided by the Contractor at the start of each testing day. The calibration shall also be witnessed by the Inspector; notify the Inspector at least 24-hours prior to each test.

All testing, including but not limited to deflection and air tests and television (TV) inspections, must be passed before final lift of paving can be placed over the pipe.

The City shall make a televised inspection of the pipe after the Contractor has completed the installation of the pipe, including all backfill, deflection and air testing but before paving. When the Contractor has jetted and cleaned the pipe, the inspection shall be scheduled by the Contractor with the Inspector. Any defects in material or workmanship shall be satisfactorily corrected at no expense to the City. The Contractor shall re-TV the pipe after any corrections in accordance with **Subsection 301.03.11D** and supply the TV video and the report to the Project Manager for review and approval. This process will repeat until the pipe complies with the specifications prior to paving.

Make tests of sections of constructed pipeline for acceptance only after all service connections, manholes, backfilling, and compaction are completed between the stations to be tested. The Project Manager may require testing of manhole-to-manhole sections as they are completed in order to expedite the acceptance of sections of pipeline and allow connections prior to the whole system being completed.

Water and Equipment for Test – The Contractor shall make all arrangements, perform the test, and provide personnel, plugs, and other necessary equipment to complete the tests at no cost to the City except that the initial TV inspection will be performed by City staff at the Contractor's expense. The method, equipment, and personnel shall be subject to approval by the Engineer.

Cleaning Prior to Testing and Acceptance – Prior to any testing for acceptance, the Contractor shall jet rod and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand silt, and other foreign material from the system at or near the closest downstream manhole. If necessary, use mechanical rodding or bucketing equipment. The Contractor shall continue to clean the system until the TV inspection shows no foreign material in the pipe. Engineer's re-inspection may be required if the amount of debris is, in the Engineer's opinion, excessive.

Repairs – Repair or replace in accordance with **Subsection 301.03.04**, and in a manner satisfactory to the Engineer, any section of pipe not meeting the air test requirements, deflection test requirements, joint testing requirements, alignment requirements, or that has leakage. Re-rounding of the pipe will only be allowed if approved by the Engineer.

301.03.11B DEFLECTION TEST FOR FLEXIBLE PIPE

In addition to air testing, perform a deflection test for all lines constructed of flexible pipe after the trench backfill and compaction has been completed to the required specifications in these ***Public Works Standards***. The test shall be conducted by pulling an approved solid pointed mandrel having at least 6 vanes through the completed pipeline. The diameter of the mandrel shall be 95% of the internal pipe diameter. Conduct testing on a manhole-to-manhole basis, and only after the manholes have been channeled and the line has been completely cleaned. Locate and repair any sections failing to pass the test and retest the section at the Contractor's sole expense.

301.03.11C AIR TESTING

301.03.11C1 Standard Air Testing

General

For pipes greater than 35-inches in diameter, refer to **Subsection 301.03.11C2** for air testing requirements.

The Engineer may, at any time, require a calibration check of the instrumentation used. Use a pressure gauge having minimum divisions of 0.10psi and an accuracy of 0.01psi. All air used shall pass through a single control panel.

All plugs used to close the pipe for the air test must be capable of resisting the internal pressures and must be securely braced. Place all air testing equipment above ground and allow no one to enter a manhole or trench where a plugged pipe is under pressure. Release all pressure before the plugs are removed. The testing equipment used must include a pressure relief device designed to relieve pressure in the pipe under test at 10psi or less, and must allow continuous monitoring of the test pressures in order to avoid excessive pressure. Use care to avoid the flooding of the air inlet by infiltrated ground water (inject the air at the upper plug if possible). Use only qualified personnel to conduct the test.

Ground Water

The presence of ground water will affect the results of the test. Determine the average height of ground water over the sanitary sewer line immediately before starting the test.

In every case, determine the height of the water table at the time of the test by exploratory holes or such other methods satisfactory to the Engineer. The Engineer will make the final decisions regarding test height for the water in the pipe section being tested.

Method

Use the time-pressure drop method for all air testing. The test procedures are described as follows:

1. Clean the pipe to be tested and remove all debris where noted.
2. Wet the pipe prior to testing, if desirable.
3. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
4. Check the average height of the groundwater over the pipe. The test pressures required below shall be increased 0.433psi for each foot of average water depth over the pipe.
5. Add air slowly to the section of pipe being tested until the internal air pressure is raised to 4.0psig greater than the average backpressure of any groundwater that may submerge the pipe.
6. After the internal test pressure is reached, allow at least 2-minutes for the air temperature to stabilize, adding only the amount of air required to maintain pressure.
7. After the temperature stabilization period, disconnect the air supply.
8. Determine and record the time, in seconds, that is required for the internal air pressure to drop from 3.5psig to 2.5psig greater than the average backpressure of any groundwater that may submerge the pipe.
9. Compare the time recorded in step 8 with the time required as determined hereinafter.

Acceptance

The tested section will be acceptable if the time recorded in step 8 above is not less than the time in seconds (T) computed by the formula: T=K/C

Where:

K = the sum of the computations (0.011 d^2L) for each size of pipe and its length in the section

C = the sum of the computations (0.0003882 dL) for each size of pipe and its length in the section, except that the minimum value for C shall be 1

d = nominal diameter of the pipe in inches

L = length of pipe in feet

Subsequent Failure – Following a successful air test, visible infiltration of ground water in any section will be considered evidence that the original test was in error or that failure of the section has occurred. Correct such failures and retest the repaired sections at no expense to the City.

301.03.11C2 Joint Air Testing for Pipe Diameters Greater than 35-Inches

General

Because of the difficulty of adequately restraining plugs and the inherent danger of air pressure on large surfaces, the Contractor is encouraged to test each individual joint for leakage using a pneumatic joint testing apparatus in lieu of performing the above required pipe

section air testing. Such testing apparatus for each pipe size to be tested shall be tested, calibrated, and approved prior to acceptance testing.

The Engineer may, at any time, require a calibration check of the instrumentation used. A pressure gauge having a minimum division of 0.1psi and an accuracy of 0.0625psi shall be used for the check. All air shall pass through a single control panel.

Groundwater

The pressure of groundwater will affect the results of the test. Determine the average height of groundwater over the pipe immediately before starting the test. The method of checking the groundwater height shall be as approved.

Evaluation

The allowable minimum time for a drop in the test air pressure from 3.5 to 2.5psi greater than the average backpressure of any groundwater will be the time per unit length, along centerline of pipe, (T) in seconds, from the following table. (One foot of groundwater over the top of the pipe adds 0.443psi to the test air pressure.)

Table 301.03.11C2 ALLOWABLE MINIMUM TIME	
PIPE INSIDE DIAMETER (Inches)	**TIME PER UNIT LENGTH (T) (along centerline of pipe) Sec./In.**
36	11.1
42	12.9
48	14.8
54	16.7
60	18.4
66	20.2
72	22.0
78	23.9
84	26.0

Testing

Testing of individual mainline pipe joints shall be done as mainline pipe laying progresses. It is the intent of this specification that a joint test will be made immediately after each mainline pipe section is laid and backfilled, and the joint gap, excluding settlement allowance, is found to be within acceptable tolerances.

At the sole discretion of the Engineer, upon satisfactory installation and testing of the first 10 successive pipe joints of each pipe size, the Contractor may elect to test joints at no greater than 1-work-day intervals instead of making tests after laying each pipe section.

If a joint does not meet the test time established herein, a reinforced concrete closure collar shall be constructed around the joint or the joint shall be reassembled as approved by the Engineer at no expense to the City.

Subsequent Failure – Following a successful air test, visible infiltration of ground water in any section will be considered evidence that the original test was in error or that failure of the section has occurred. Correct such failures and retest the repaired sections at no expense to the City.

301.03.11D TELEVISION INSPECTION OF SANITARY SEWER PIPES

Upon completion of all sewer construction, repairs, cleaning, and required tests, notify the Inspector that all lines are ready for TV inspection.

The Engineer may, at its own option, perform a deflection test at the same time it performs its TV inspection.

After being notified, the Engineer shall commence examination of lines. Findings will be recorded. Correct all deficiencies at no expense to the City.

Upon correction of deficiencies revealed by TV inspection, the Contractor will be responsible for providing a TV inspection and verifying repairs at no expense to the City.

The TV inspection shall be conducted by a technical service that is equipped to make audio-visual tape recordings. The audio-visual tape recording shall:

A. Be in color electronic format acceptable to the Engineer and be continuous from beginning to end of each pipe run

B. Be clear, usable, and free of visual distortions; the image in the video shall appear level

C. Include a visual footage meter recording on the tape

D. Include a voice recording of suspected deficiencies

E. Use a 360º pan and tilt camera

F. Be performed by experienced personnel trained in locating breaks, obstacles, and service connections by remote video inspection utilizing a 360º pan and tilt camera

G. Identify visually, with audio, and on the written report the location of the beginning and end of each pipe run, the lineal feet of pipe, all deficiencies, the name of the company creating the tape recording, name of the operator, and date and time of the tape recording

H. Include a 360º inspection of each joint

I. Include a clear view up each lateral connection

J. Identify groundwater infiltration sources associated with construction or material defects

Submit the audio-visual tape and written report to the Engineer for review. Correct all deficiencies that are revealed in the tape and written report. Make an additional TV inspection of repaired pipes at no additional cost to the City. All tapes and written reports shall become the property of the City.

Locate and repair any sections failing to pass the required tests and inspections. Repeat the specified test and inspections on those sections at no expense to the City.

301.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

301.04.01 SANITARY SEWER PIPE

Measurement and payment for sanitary sewer pipe, including gravity sanitary sewers, pressure sanitary sewers, and pipe stub-outs from manholes, will be made on a lineal foot basis for the

various classes, types, and sizes of pipe listed in the Contract Documents and as actually installed. All pipe, except sanitary sewer laterals, will be measured horizontally from center-to-center of manholes or to the ends of the pipe, whichever is applicable. No deductions will be made for fittings or for structures unless specifically called out in the construction drawings or elsewhere in this document.

Measurement and payment for sanitary sewer lateral pipe will be made on a horizontal foot basis for the type and size of pipe installed as shown in the Contract Documents. Length will be measured as the horizontal distance, commencing at the point of connection to the tee, wye, manhole, or pipe, as applicable and terminating at the end of the pipe or at the point of reconnection to the existing sanitary sewer lateral, including all fittings, measured along the horizontal centerline of the service if risers are not included in the Contract Documents. If risers are included in the Contract Documents as a separate pay item, then the horizontal distance will start at the top of the riser and terminate at the end of the pipe or point of reconnection to the existing sanitary sewer lateral.

Payment shall constitute full compensation for the pipe in place, including furnishing, placing, and compacting pipe bedding and pipe zone material, testing, plugs, and the markers for sanitary sewer laterals.

301.04.02 Service Risers

Measurement and payment for service risers will be made on a lineal foot basis for type and size of pipe installed as shown in the Contract Documents. Length will be measured from the tee at the main line to the bend at the top of the riser. Compensation will include all pipe, fittings, bedding, pipe zone, backfill, labor, and equipment to install the riser complete in place. If no separate item is included in the Contract Documents, then compensation for the riser assembly will be included in the price per foot for the sanitary sewer lateral. If a wye and a ⅛ bend are used in place of a tee, payment will begin at the wye at the main line.

The Engineer will determine the length of each riser. That length will be set by the sanitary sewer lateral depth requirement at the property line with a 2% slope back to the top of the riser.

301.04.03 Tee and Wye Fittings

Measurement and payment for service tees and wyes installed in the sanitary sewer lines will be made at the unit price for each size and type as shown in the Contract Documents. If no item is listed in the Contract Documents, then the tee and wye fittings will be incidental to the sanitary sewer lateral and main line installation and no extra compensation will be allowed. Since no deduction will be made under the payment item for pipe for the length of the tee or wye, the unit price for tee and wye fittings shall include only the additional cost of furnishing and installing the tee or wye fitting over the cost of furnishing and installing an equivalent straight run of pipe. Payment will include full compensation for pipe plugs, stoppers, or caps installed.

301.04.04 Closure Collars

Measurement and payment for closure collars will be made at the unit price each as shown in the Contract Documents and actually constructed. Payment shall include full compensation for all materials, equipment, and labor necessary to complete the work. If not listed in the Contract Documents, then they will be considered incidental to the other work.

301.04.05 Field Fabricated Connections

Measurement and payment for field-fabricated connections will be made at the unit price each for the type and size as shown in Contract Documents. Payment shall include full compensation for all materials, equipment, and labor necessary to complete the work. If not shown in the Contract Documents, then they will be incidental to the other work.

301.04.06 Cleanouts

Measurement and payment for cleanouts will be made at the unit price each for the type and size as shown in the Contract Documents. Payment shall include full compensation for all materials, equipment, and labor necessary to complete the work.

301.04.07 Other Items

Measurement and payment for other items not specified above shall be made at either the unit price or lump sum basis for each bid item as shown in the Contract Documents, or the incidental basis for work not listed in the Contract Documents. Payment shall be full compensation for all materials, equipment, and labor necessary to complete the work.

302 Manholes and Concrete Structures

302.01 Description

This section covers the work necessary for the construction of the following items:

A. Manholes

B. Drop assemblies

C. Special concrete structures

D. Concrete encasement

E. Anchor walls

302.02 Materials

302.02.01 Base Rock

Use ¾”-0”, 1”-0”, or 1½”-0” base rock as approved, conforming to the requirements for aggregate backfill material in **Subsection 206.02.05**.

302.02.02 Forms

Forms for exposed surfaces shall be steel or plywood. Other surfaces shall be formed by means of matched boards, plywood, or other approved material. Form all vertical surfaces. Trench walls, large rock, and earth shall not be used as form material.

302.02.03 Concrete and Reinforcing Steel

Concrete and reinforcing steel shall conform to **Section 205**.

302.02.04 Cement Mortar

When specified for use, cement mortar shall conform to **Section 205**. Consistency of mortar shall be such that it will readily adhere to the pipe. Mortar mixed for longer than 30-minutes shall not be used.

302.02.05 MANHOLES

302.02.05A STANDARD PRECAST MANHOLE SECTIONS

Precast manhole sections shall conform to the Standard Details and be in conformance with ASTM C478. Minimum wall thickness shall be 5-inches. Top and bottom of all sections shall be parallel. Tongue and groove manhole sections will not be allowed.

Provide eccentric cones for all manholes over 4-feet from crown of pipe to rim. Eccentric cone sections shall conform to all the requirements of ASTM C478, with the exception of the steel reinforcement requirement, and shall have same wall thickness and reinforcement as the riser manhole sections. Eccentric cones shall be designed to withstand AASHTO H-20 loadings.

Flat slab tops with precast grooves reinforced to withstand AASHTO H-20 loadings shall be provided for manholes 4 or fewer feet deep from crown of pipe to rim. Manholes with 2 to 4-feet from crown of pipe to rim shall have eccentric access flat slab tops. Manholes with less than 2-feet from crown of pipe to rim shall have concentric access flat slab tops.

Prior to the delivery on the job site of any size of precast manhole section, yard permeability tests may be conducted at the point of manufacture. The precast sections to be tested will be selected at random from the stockpiled material that is to be supplied for the job. All test specimens will be mat tested and shall meet the permeability test requirements of ASTM C14 and ASTM C497.

302.02.05B PRECAST CONCRETE BASES

Manholes, except when placed over existing pipes, shall be constructed using precast, reinforced concrete bases. Construction of precast bases shall conform to the requirements of ASTM C478. The base riser section shall be integral with the base slab. The riser section shall extend a minimum of 8-inches above the crown of the largest mainline pipe entering the manhole exclusive of drop lines.

302.02.05C POURED-IN-PLACE MANHOLE BASES

The Contractor may use poured-in-place manhole bases only over existing sewer pipes. Concrete shall conform to **Section 205**.

302.02.05D MANHOLE GRADE RINGS

Concrete grade rings for extensions shall be key-lock joint and shall be designed to withstand AASHTO H-20 loadings.

302.02.05E JOINTING MATERIALS

Manhole jointing materials shall conform to **Subsection 205.02.09D**.

302.02.05F MANHOLE STEPS

Steps for concrete manholes shall be steel reinforced polypropylene plastic, M. A. Industries, Inc., No. PS1-PF, or Lane International Corp. No. P-10938, or approved equal with red reflectorized markers on the top of the step wings. All steps shall be in conformance with ASTM C478 and ASTM C497 except that the minimum horizontal pullout load shall be 1,500 pounds. The steel shall be Grade 60, ½-inch deformed reinforcing bar conforming to ASTM A615. The polypropylene shall conform to ASTM D4101 Type II. The steps shall be capable of withstanding an impact load of 70 pounds at 20º F without cracking or fracturing.

The entire polypropylene plastic material surrounding the reinforcing steel bar shall be encased monolithically and have a minimum thickness over the steel of 1/16-inch. Excessive voids will be cause to have the steps rejected by the Engineer.

302.02.06 Manhole and Cleanout Frames and Covers

302.02.06A General

All castings shall be true to size, weight, and tolerances shown on the Standard Details. Delivered weight shall be ±5% of the specified weight. The bearing seat shall not rock when checked by the test jig. The foundry shall supply all test gauges and shall not subcontract any of the work other than testing procedure, patterns, machining, and cartage. The casting shall not be made by the open-mold method and shall be free of porosity, shrink cavities, cold shuts, cracks, or any defects that would impair serviceability. Repair of defects by welding or by the use of "smooth-on" or similar material will not be permitted. All castings shall be shot or sand blasted and the application of paint or other coating will not be permitted. Each casting shall have directly cast upon it the initials of the manufacturer and the year of the cast. These characters shall be a minimum of 1¼-inch in height and ⅛-inch in relief. The heat number shall be cast upon each casting. The foundry or Contractor shall provide all labor and equipment for handling all castings during testing and inspection.

All manhole frames and covers located outside of the right-of-way shall be tamper-proof.

302.02.06B Materials

Conform to ASTM A48, Class 30B and AASHTO M 105, Class 30B, with the following modifications and additional requirements:

Tensile Strength ……	30,000psi
Traverse Strength (1.2 diameter bar 18” centers):	
Load ……	2,600 – 3,000 lbs.
Deflection ……	0.22” – 0.34”
Brinell Hardness (as cast) ……	173 – 200

Where the ASTM A48 and ASSHTO M 105 specifications differ, the more stringent shall apply.

The foundry shall certify as to the tensile and traverse properties and the Brinell hardness.

302.02.06C Inspection

The Engineer reserves the right to require a rough transverse bar (size of bar 1.2-inch diameter x 20-inches long) and/or a tensile bar as per ASTM A48 for each 20 castings, or heat when less than 20 castings are made.

The following tests shall be performed at the Engineer’s option in accordance with one or both of the following methods:

Method A shall consist of testing tensile specimens in accordance with ASTM A48. The Engineer shall be notified at least 24-hours in advance of casting the units and bars so that she may be present at the time of the melt to permit identification of both bars and castings. The test specimens shall be provided and machined by the manufacturer to the dimensions specified for Specimen B of ASTM A48. Machining of the test specimens shall be at no expense to the City.

Method B shall consist of a proof load test. The cover, when resting in its frame, shall sustain a 40,000 pound vertical load applied through a 1-inch thick x 9-inches x 9-inches ASTM A36 steel plate on a ¼-inch rubber pad centered on the manhole cover.

The specified loads shall be applied by a calibrated testing machine and held for a period of 1-minute. Upon removal of the load, the test specimens shall be examined for cracks and permanent deformation. Any cracks or permanent deformation shall be cause for rejection.

The testing will be performed by the City at no expense to the City.

Test specimens shall be selected by the Engineer and tested as follows:

A. Two assembled test specimens shall be proof-load tested for each 20 castings or heat when less than 20 castings are made from one heat (lot).

B. If the tested specimens of a designated lot pass the test, all of the units of that lot shall be considered as complying with the load requirements.

C. If either of the tested specimens of a designated lot fails to pass the test, then 5 additional specimens from the same lot shall be selected for testing.

D. If the 5 additional specimens pass the load requirements of the test, the total number of that lot to be furnished shall be considered as complying with the requirements except that any of the previous test specimens that failed to meet the load test requirements shall be rejected.

E. If any of the 5 additional specimens fail to meet the load test requirements, the entire lot shall be rejected except for the test specimens that passed the test. All covers that pass this test will be returned. The City will not be responsible for those that fail the test.

302.02.06D CAP SCREWS

Cap screws and washers for tamperproof and watertight manhole covers shall be stainless steel with 60,000psi minimum tensile strength conforming to ASTM A453.

302.02.07 NON-SHRINK GROUT

Conform to requirements of **Subsection 205.02.07C**.

302.02.08 DROP ASSEMBLIES

Use the Reliner inside drop or approved equal.

302.02.09 CONCRETE ENCASEMENT

When specified, tube type polyethylene encasement shall conform to ANSI/AWWA C105/A21.5.

302.03 CONSTRUCTION

302.03.01 GENERAL

302.03.01A EXCAVATION AND BACKFILL

Conform to applicable provisions in **Section 206**. Backfill around manholes, cleanouts, and other appurtenances shall be of the same quality as the trench backfill immediately adjacent.

302.03.01B BASE ROCK

Place crushed aggregate base rock and thoroughly compact with a mechanical-vibrating or power tamper.

302.03.01C FOUNDATION STABILIZATION

If material in bottom of excavation is unsuitable for supporting manholes and other sewer appurtenances, excavate below subgrade as required by soil conditions and backfill to required grade with rock conforming to Foundation Stabilization in **Subsection 206.03.07**.

302.03.02 MANHOLES

Prepare the soil and base rock for manholes by leveling and compacting to provide a uniform bearing surface. If necessary, install foundation stabilization material as specified in **Subsection 302.03.01C** above.

Manholes over existing pipes shall be constructed using a cast-in-place base. Densify the concrete base by vibrating or working, and screed to provide a level surface for precast riser sections or formed walls. Deposit sufficient mortar on the base to assure watertight seal between base and manhole wall or place the first precast section of manhole in the concrete base before the concrete has set, if preferred. The precast section shall be properly located and plumb. Stacking additional manhole sections shall be prohibited until the concrete has cured a minimum of 24-hours in moist conditions.

Precast manhole bases, precast riser sections, and other precast appurtenances shall conform to ASTM C478 and shall be placed plumb.

When placing precast manhole sections, clean the ends of any foreign material prior to placing any jointing material. Then place the jointing material and the next precast section.

Preformed plastic gaskets shall be installed in strict accordance with the manufacturer's recommendation. Only pipe primer furnished by the gasket manufacturer will be approved. When using preformed plastic gaskets, manhole sections with chips or cracks in the joint surfaces shall not be used. Completed manholes shall be rigid and all manholes shall pass the vacuum test. Construct manhole inverts in conformance with the Standard Details and with smooth transitions to ensure an unobstructed flow through manhole. Where a manhole is poured over a section of pipe, the top portion of the pipe to the full width of pipe and diameter of the manhole shall be removed. Smooth and then cover the exposed edges of pipe completely with mortar. Trowel all mortar surfaces smooth. Apply an approved curing compound or use a comparable approved method to cure cement-based grouts and mortar. Chip-out, remove, and replace all defective or cracked mortar.

The inside of all manholes will be grouted smooth on all spaces between rings and on all picking holes.

Holes for installing pipe into precast manhole sections shall be cast-in-place or core drilled. Making a hole for a pipe in a manhole section by impact-based methods (jackhammer, percussion hammer, etc.) or sawcutting shall not be allowed.

Channels shall be sloped such that the design drop through the manhole is uniformly graded between the inlet and the outlet pipes. When more than one pipe enters a manhole, the lowest inlet pipe will be uniformly graded to the outlet pipe and the other inlet pipes shall uniformly meet the grade of the channel. Channels shall be formed to allow a 3-foot long by 6-inch diameter TV camera to enter all pipes. If, at the time of TV acceptance testing, it is found that the camera is obstructed from entering any pipe, the Contractor shall, at his sole expense, revise the channels as necessary. Construct cast-in-place channel and shelf in the field in one operation. Finish concrete shelf between channels with a brush. Precast channels will not be allowed.

302.03.03 Drop Assemblies

Construct drop assemblies at locations indicated and as shown on the Standard Details. Drop assemblies shall not be constructed for pipes where the invert is less than 2-feet above the invert of the outgoing pipe.

302.03.04 Pipe Stub-outs from Manholes

Install stub-outs from manholes at locations as shown on the plans or as required by the Engineer. Pipe connections to manholes shall be grouted watertight with non-shrink grout using an approved commercial concrete bonding agent applied to all concrete surfaces being grouted. Provide watertight manhole adapters for PVC pipe connections. Pipe connections to the cone section of a manhole are prohibited unless specifically approved by the Engineer prior to construction.

302.03.05 Manhole Grade Rings

In general, manhole grade rings will be used on all manholes in streets or roads or other locations where a subsequent change in existing grade may take place. Extensions will be limited to a maximum height of 12-inches.

Install appropriate combination of grade rings to a height that will accommodate the finish manhole surface elevation as shown on the plans. Lay grade rings in mortar with sides plumb and tops level. All grade ring joints shall be constructed using an approved commercial concrete bonding agent applied to all cured concrete surfaces being mortared. No joints, necks, frames, or grade rings shall be mortared without an approved bonding agent. Water as a substitute for commercial concrete bonding agent will not be approved. Grade ring extensions shall be watertight.

302.03.06 Manhole and Cleanout Frames and Covers

Set frame in a bed of mortar carried over the flange of the frame. In off-road locations the frame and cover shall be set to 1-foot above existing ground. Off-road manholes shall use the off-road manhole frame and cover. Where the rim is 4-foot or less from the finished ground elevation use the frame and cover shown in **Standard Details 208 and 305, Off-Road Elevated Frame Assembly and Cover (HINGE)**. Where the rim is more then 4-foot from the finished ground elevation use the frame and cover shown in **Standard Details 209 and 306, Off-Road Elevated Frame Assembly and Cover (PIN)**. When frames and covers are installed in unpaved vehicular accessways, a 5-foot x 5-foot pad, 4-inches thick of asphaltic concrete, shall be placed to finished grade centered around the frame. In areas to be paved, the frame and cover shall be adjusted to final finish grade after the first lift of AC has been placed and prior to the final lift. The void between the frame and the first lift of AC will be filled with Type “B” grout conforming to **Subsection 205.02.07B**.

302.03.07 Vacuum Testing

All sanitary sewer manholes, except those with pipes larger than 24-inches in diameter, shall be tested for acceptance after backfilling, compaction, and paving. Manholes with pipes larger than 24-inches in diameter will only be visually inspected for infiltration.

Manholes shall be vacuum tested as follows:

A. Each manhole may be tested immediately after assembly and prior to backfilling for Contractor information and ease of repair if necessary. Acceptance testing will be accomplished after backfilling and final paving is complete.

B. All lift holes shall be plugged with an approved non-shrink grout. Manhole frame to grade ring or cone connection shall use commercial concrete bonding agent and non-shrink grout.

C. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.

D. The test head shall be placed at the inside of the top of the manhole frame and the seal inflated in accordance with the manufacturer's recommendations. The seal at grade rings and frame shall be subject to the test.

E. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter, 75 seconds for 60-inch, and 90 seconds for 72-inch diameter manholes.

F. If the manhole fails the initial test, necessary repairs shall be made with an approved non-shrink, quick setting grout. Re-testing shall proceed until a satisfactory test is obtained.

302.03.08 Concrete Encasement

Conform to the requirements shown on **Standard Detail 213, Pipe Concrete Encasement**. Foundation stabilization, if necessary, shall be completed and the bottom of the trench compacted, as approved. Sides of encasement shall be formed, not poured, against soil or rock unless specifically approved by the Engineer.

Support pipe true to line and grade before and during placement of concrete. Encasement shall be placed in a minimum of 2 lifts. Place concrete starting at the lower end of the encasement. Adequately support the pipe to prevent pipe deflection during concrete placement and initial set.

After concrete encasement has been placed and taken an initial set, cure by covering with well-moistened earth or backfill material.

302.03.09 Anchor Walls

See **Standard Detail 212, Pipe Anchor Wall**. Do not over-excavate in the areas where the anchor walls are to be poured. Construct suitable forms that will allow the downhill wall face to have a full-bearing surface against undisturbed earth. Cure concrete for 5-days before conducting air testing.

302.03.10 Manhole Steps

Steel reinforced polypropylene steps are to be installed in precast concrete manhole cones and sections by the manhole manufacture prior to delivery to the job site, except for in shallow, flat-top manholes. Shallow, flat-top manholes shall have the manhole steps installed in the field by the Contractor with guidance and approval from the Engineer.

Installation of the steps shall be in accordance with the manufacturer’s recommendations and as approved by the Engineer. All steps within a manhole shall be of the same design, type, and size (mixing of unmatched steps within the same manhole is not permitted). Steps shall be aligned vertically, and loose steps shall be cause for rejection of the manhole cone or section.

302.03.11 Cleaning

Upon completion, clean each structure of all silt, debris, construction-related sediment, and foreign matter.

302.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

302.04.01 MANHOLES

Measurement and payment for manholes will be made on a unit price basis for each type shown in the Contract Documents for concrete manholes 0 to 8-feet deep, plus the unit price per foot shown in the Contract Documents for extra depth of manholes over 8-feet. No deduction will be made for depths less than 8-feet. Measurement of manhole depth will be from the top of the manhole frame and cover to the manhole invert at the center of the manhole to the nearest 1/10-foot. Payment shall include full compensation for all excavation, backfill, materials, labor, and foundation stabilization or base rock when required, steps, manhole frame and cover as required, pipe stubs and plugs, and equipment required to construct the manhole complete-in-place.

No separate payment shall be made for manhole steps. Payment for manhole steps shall be made as part of the installation or modification of manholes.

302.04.02 DROP ASSEMBLIES

Measurement and payment for drop assemblies will be made on a unit price basis as shown in the Contract Documents for drop assemblies 2-feet in depth, plus the unit price per foot shown in the Contract Documents for extra depth over 2-feet. No deduction will be made for depths less than 2-feet. Drop assemblies will be vertically measured from the invert of the pipe at the top of the assembly to the bottom of the assembly to the nearest 1/10-foot. Payment shall include full compensation for all materials, labor, and equipment required to construct the work complete-in-place.

302.04.03 TAMPERPROOF AND WATERTIGHT MANHOLE FRAMES AND COVERS

Measurement and payment for tamperproof and watertight manhole frames and covers shall be considered as incidental to the construction of manholes and no separate payment shall be made.

302.04.04 CONCRETE ENCASEMENT

Measurement and payment for concrete encasement will be made on a lineal foot basis as shown in the Contract Documents for the size pipe to be encased. Length shall be measured along the centerline of the pipe. Payment shall include full compensation for all materials, equipment, and labor required to construct the work complete-in-place.

302.04.05 ANCHOR WALLS

Measurement and payment for anchor walls shall be made on a unit price basis for each unit installed. Payment shall include full compensation for all materials, equipment, and labor necessary to construct the work complete-in-place.

302.04.06 OTHER ITEMS

Measurement and payment for other items not specified above shall be made at either the unit price or lump sum basis for each bid item as shown in the Contract Documents or shall be incidental for work not listed in the Contract Documents. Payment shall be full compensation for all materials, equipment, and labor necessary to complete the work.

303 Work on Existing Sanitary Sewer Pipes

303.01 Description

This section covers the work necessary to join new work to existing, the abandoning of sanitary sewer lines, and structures, and adjusting existing utility structures to finished grades, and shall include the requirements of **Sections 301 and 302** unless otherwise modified herein.

303.02 Materials

Conform to requirements of **Section 205** and to the requirements for related work referred to herein.

303.02.01 Pipe Patch Repair

Pipe patch repairs shall be conducted using resin and fiberglass cured-in-place pipe meeting the standards of ASTM F1216 and ASTM D790. Pipe patch material shall be PipePatch Pipe Repair Systems by Source One Environmental or approved equal.

303.03 Construction

303.03.01 Excavation and Backfill

Conform to requirements of **Section 206**.

303.03.02 New Manholes Over Existing Sanitary Sewer Lines

Advise Engineer of system for diverting sewage flow and obtain authorization before starting. The Contractor shall be solely responsible for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.

Perform necessary excavation and construct new manholes in conformance with applicable requirements of **Section 302**.

New manholes shall be constructed over existing concrete sanitary sewer lines after first cleaning and applying approved commercial concrete bonding agent to all surfaces of the pipe that will be in contact with the manhole. Manholes shall be constructed over existing PVC sanitary sewer lines after first applying a dense coating of clean mortar sand to all pipe surfaces that will be in contact with the manhole, using PVC solvent cement. After the cement has cured, commercial concrete bonding agent shall be applied to the sand prior to placement of concrete. Water as a substitute for commercial bonding agent will not be allowed.

Prevent broken material or debris from entering wastewater flow. Maintain flow through existing sanitary sewer lines at all times. Protect new concrete and mortar for a period of 7 days after placing. All sanitary sewer manholes shall be vacuum tested in accordance with **Subsection 302.03.07**. Premature breakage into the existing sanitary sewer line prior to testing shall not excuse the requirement for testing.

303.03.03 Connection to Existing Sanitary Sewer Pipe

Connections of building sewers to sanitary sewer laterals shall be made watertight. Transition couplings between dissimilar pipe materials shall be made using approved commercial adapters with No. 305 stainless steel bands such as Fernco, Calder, or approved equal. Transitions between similar pipe materials shall be made at the nearest adequate joint.

Connection of new sanitary sewer laterals to existing mains shall be made where possible to existing tees or wyes previously installed and plugged. The plug shall be removed and connection made in accordance with the applicable portions of this section. Where tees or wyes for connection are absent or unusable, connection of sanitary sewer laterals shall be made with an approved tap such as Sealtite saddle, Inserta Tee, or approved equal commercial tap. Taps will not be allowed when the main is degraded, or otherwise lacks structural integrity, and taps which are for sanitary sewer laterals of the same nominal diameter as the main will not be allowed. In cases where taps are not allowed, tees will need to be cut into the main.

All taps and cut-in tees shall be inspected and approved by the Inspector prior to covering.

Taps shall be installed without protrusion into or damage to the existing sanitary sewer line. No compromise of the sanitary sewer line will be allowed, such as undermining and settlement of the pipe grade, debris in the pipe, or longitudinal or transverse cracking of the sanitary sewer pipe. Any necessary repairs will be at the Contractor's sole expense. If it is necessary to cut in a tee, rigid couplers (solid sleeves), manufactured to couple PVC pipe, will be required when connecting PVC pipe. When rigid couplers cannot be used, flexible mechanical compression joint coupling with No. 305 stainless steel bands such as Fernco, Calder, or approved equal, shall be used on both sides of the tee.

303.03.04 Disconnect and Reconnect Existing Sanitary Sewer Laterals

When shown or required, disconnect existing sanitary sewer laterals from existing sanitary sewer mains and reconnect them to the new mains. The Contractor shall be responsible for locating the existing sanitary sewer laterals prior to installing the tee or wye in the new sanitary sewer line. The Contractor shall verify and reconnect all active sanitary sewer laterals to the sanitary sewer main.

303.03.05 Removal of Existing Pipes, Manholes, and Appurtenances

When pipes are extended from cleanouts, the entire cleanout assembly, including the wye, shall be removed.

Existing pipes, manholes, and appurtenances that lie in the line of and are to be replaced by the new construction shall be removed from the site and disposed of as provided for in **Section 204**.

303.03.06 Filling Abandoned Structures

Existing structures shown to be abandoned shall be filled with granular backfill material as specified in **Section 206**. Compact to at least 90% maximum density as determined by ASTM D1557. Remove structure frame and cover or grate and plug all pipes with permanent plugs as specified. Break or perforate the bottom to prevent the entrapment of water.

303.03.07 Existing Manhole Frames and Covers

Manhole frames and covers removed by the Contractor that will not be reused on the project shall become the property of the City. Notify the Engineer a minimum of 1-day prior to removal to arrange for picking up the removed frames and covers.

303.03.08 Permanent Plugs

Clean interior contact surfaces of all pipes to be cut off or abandoned. Construct concrete plug in end of all pipe 18-inches or less in diameter. Minimum length of concrete plugs shall be 8-inches. For pipe larger than 18-inches, the plugs may be constructed of common brick or concrete block. Plaster the exposed face of block or brick plugs with mortar. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage. Where required by the Engineer, abandoned pipes may be required to be filled with grout or CLSM.

All laterals shall be appropriately plugged and abandoned at the main line. Main lines shall be patched using material as specified in **Subsection 303.02.01**.

303.03.09 Adjusting Existing Structures to Grade

Existing manholes, cleanouts and similar structures shall be brought to the specified finished grade by methods of construction as required in **Section 610**.

303.03.10 Reconstruct Manhole Base

Conform to applicable requirements of **Section 302**. Exercise caution in chipping out existing concrete base to prevent cracking of manhole walls. Prevent all material from entering the sewer flow. Pour new base to a minimum of 6-inches below the lowest projection of the pipe. Construct new channels to the elevations shown. Conform to details for channel construction in the Standard Details. Repair any cracks that occur, as a result of work operations, with new grout to form a watertight seal.

303.03.11 Connect to Existing Structures

Conform to applicable requirements of **Section 302**. Sawcut opening in structure with a concrete saw and grout in a watertight seal between the new pipe and structure wall. Plaster mortar smooth inside pipe opening. Alignment, slope of pipe, and other construction details shall be as specified.

303.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

303.04.01 New Manholes Over Existing Sanitary Sewer Lines

Measurement and payment for new manholes over existing sanitary sewer lines will be made at the unit price for each. Payment will include compensation for excavation and backfill, constructing manhole over existing line (complete-in-place), final adjustment to grade, maintaining flow, and forming new flow channel.

303.04.02 Disconnect and Reconnect Existing Sanitary Sewer Laterals

Measurement and payment for disconnecting and reconnecting existing sanitary sewer lateral will be made at the unit price for each as shown in the Contract Documents. Payment shall include full compensation for locating the existing sanitary sewer lateral, rerouting any flow, making the disconnection, and reconnecting the new sanitary sewer lateral with the existing building sewer and sanitary sewer main. When not shown as a separate item in the Contract Documents, the disconnection and reconnection will be included in the sanitary sewer lateral cost.

303.04.03 Removal of Existing Pipes, Manholes, and Appurtenances

Payment for removal and disposal of existing pipes, manholes, and appurtenances will be considered as incidental to the work and included in the bid item for excavation and backfill as specified in **Section 206**.

303.04.04 Filling Abandoned Structures

Measurement and payment to filling abandoned structures will be made on a unit price each basis.

303.04.05 Adjusting Existing Structures to Grade

Measurement and payment for adjusting existing manholes, cleanouts, and similar structures will be made on a unit price each basis for the type shown in the Contract Documents. If no item is included in the Contract Documents for “adjust existing structures to grade”, all costs will be considered incidental work for which no separate payment will be made.

303.04.06 Reconstruct Manhole Base

Measurement and payment for reconstructing manhole base will be made on a unit price each basis. If no item is included in the Contract Documents for “reconstruct manhole base”, all costs will be considered incidental work for which no separate payment will be made.

303.04.07 Connect to Existing Structures

Measurement and payment for connection to existing structures will be made on a unit price each basis. If no item is included in the Contract Documents for “connection to existing structures”, all costs will be considered incidental work for which no separate payment will be made.

303.04.08 Other Items

Measurement and payment for other items not specified above shall be made at either the unit price or lump sum basis for each bid item as shown in the Contract Documents, or incidental for work not listed in the Contract Documents. Payment shall be full compensation for all materials, equipment, and labor necessary to complete the work.

End of Chapter

CHAPTER 400 - STORMWATER TECHNICAL REQUIREMENTS

401 PIPES AND FITTINGS

401.01 DESCRIPTION

This section covers the following work:

A. Gravity stormwater pipes

B. Fittings

401.02 MATERIALS

401.02.01 GENERAL

Use all stormwater pipe and fittings of the size, strength, material, and joint type specified on the Standard Details and/or the Contract Documents. Use jointing material as hereinafter specified for each pipe material. Each piece of pipe shall be clearly identified as to strength, class, and date of manufacture. The manufacturer or fabricator shall furnish appropriate certification, based on manufacturer's routine quality control tests, that the materials in the pipe and fittings meet the requirements specified herein. Strength, permeability, hydrostatic tests, and pipe joints will be used as the basis of acceptance as described under **Subsection 401.03.07**. Minimum length of pipe shall be 3.5-feet.

Do not coat pipes for stormwater internally or externally with any substance of any type in an attempt to improve its performance when tested.

401.02.02 REINFORCED CONCRETE PIPE

Reinforced concrete pipe, joints, and fittings shall conform to requirements of **Subsection 301.02.02**.

401.02.03 DUCTILE IRON PIPE

Ductile iron pipe, joints, and fittings shall conform to requirements of **Subsection 301.02.03**.

401.02.04 POLYVINYL CHLORIDE (PVC) PIPE

Polyvinyl chloride pipe, joints, fittings and coupling adaptors shall conform to requirements of **Subsection 301.02.04**.

401.02.05 HIGH DENSITY POLYETHYLENE (HDPE) PIPE, SOLID WALL

Solid wall HDPE pipe, fittings and couplings shall conform to the requirements of **Subsection 301.02.05**.

401.02.05A JOINTS FOR HDPE SOLID WALL PIPE

Rubber gaskets for HDPE Solid Wall pipe shall conform to ASTM D3212.

401.02.06 POLYPROPYLENE DUAL WALL PIPE

Smooth interior, annular corrugated exterior polypropylene pipe and associated polypropylene fittings shall be watertight and shall conform to AASHTO M 330 or ASTM F2881. All

polypropylene dual wall pipe shall be ADS HP Storm pipe, or approved equal, smooth interior corrugated exterior bell and spigot type pipe with a minimum pipe size of 12 inches.

401.02.06A JOINTS FOR POLYPROPYLENE DUAL WALL PIPE

Rubber gaskets for Polypropylene pipe shall conform to ASTM F477.

401.02.06B FITTINGS FOR POLYPROPYLENE DUAL WALL PIPE

Polypropylene fittings shall conform to ASTM F2881 or AASHTO M 330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gasket meeting the watertight joint performance requirements of ASTM D3212.

401.03 CONSTRUCTION

401.03.01 EXCAVATION AND BACKFILL

Conform to the requirements of **Subsection 301.03.01.**

401.03.02 LINE AND GRADE FOR GRAVITY STORMWATER LINES

Line and grade gravity stormwater lines shall conform to **Subsection 301.03.02**.

401.03.03 PIPE DISTRIBUTION AND HANDLING

Pipe distribution and handling shall conform to **Subsection 301.03.03**.

401.03.04 PIPE LAYING AND JOINTING OF PIPES AND FITTINGS

Pipe laying and jointing of pipes and fittings shall conform to **Subsection 301.03.04.**

401.03.04A POLYPROPYLENE DUAL WALL PIPE

The Contractor shall use the same material for all pipe and fittings between two consecutive structures, unless otherwise approved by the Engineer. Gaskets shall be installed by the pipe manufacturer. The use of a manufacturer specified joint lubricant is required on the gasket and bell during assembly. All installation shall be in accordance with ASTM D2321 with the exception that minimum depth shall conform to the requirements of **Subsection 4.03.02**.

401.03.05 SERVICE CONNECTION MARKERS

After the stormwater lateral is installed, block the capped or plugged end and install the 2-inch x 4-inch marker. Extend markers at least 24-inches above the ground surface. Green magnetic tape with “storm drain” in red letters shall be laid 1-foot above the top of the stormwater lateral from the main line then wrapped around the cap at the end of the service and brought to the surface wrapped around the 2-inch x 4-inch marker. Paint the top portion of the marker after its installation with first-quality green, quick drying enamel. After the paint has dried, use black, quick-drying enamel and neatly indicate the distance from the natural ground surface to the top of the stormwater lateral in feet and inches.

Take precautions during the backfilling operation to ensure the position and location of the marker remain in place. If the marker is broken or knocked out of vertical alignment during the backfilling operation, reopen the trench and replace the marker.

401.03.06 CLOSURE COLLARS

Closure collars shall conform to **Subsection 301.03.07**.

401.03.07 TESTING

401.03.07A GENERAL

When required by the Contract Documents or when the groundwater is too low to permit the visual inspection of leaks or when the quality of materials used or workmanship performed during the construction of stormwater lines is in doubt for any reason, the Engineer may require the stormwater line and all applicable appurtenances to be tested. When so, the stormwater line shall be required to pass the same tests as specified for wastewater lines in **Subsection 301.03.11**.

Perform the tests in a manner satisfactory to the Engineer. Calibrate gauges for air testing with standardized test gauge provided by the Contractor at the start of each testing day. The Inspector shall also witness the calibration. Notify the Inspector at least 24-hours prior to each test.

All testing, including but not limited to deflection and air tests, if required, and TV inspections, must be passed before final lift of paving can be placed over the pipe.

The City shall make a televised (TV) inspection of the pipe after the Contractor has completed the installation of the pipe, including all backfill and including deflection and air tests if required, but before paving. When the Contractor has jetted and cleaned the pipe, the inspection shall be scheduled by the Contractor with the Inspector. Any defects in material or workmanship shall be satisfactorily corrected at no expense to the City. The Contractor shall re-TV the pipe after any corrections, in accordance with **Subsection 301.03.11D** and supply the TV video and the report to the Project Manager for review and approval. This process will repeat until the pipe complies with the specifications prior to paving.

The Project Manager may require testing of manhole-to-manhole sections as they are completed in order to expedite the acceptance of sections of stormwater lines and allow connections prior to the whole system being completed.

Water and Equipment for Test – Water and equipment for tests shall conform to the applicable portion of **Subsection 301.03.11A**.

Cleaning Prior to Testing and Acceptance – Cleaning shall conform to the applicable portion of **Subsection 301.03.11A**.

Repairs – Repair or replace in accordance with **Subsection 301.03.04 and 401.03.04**, and in a manner satisfactory to the Engineer, any section of pipe not meeting the air test requirements, deflection test requirements, joint testing requirements, alignment requirements, or which has leakage and/or infiltration. Re-rounding of the pipe will only be allowed if approved by the Engineer.

401.03.07B DEFLECTION TEST FOR FLEXIBLE PIPE

Deflection tests for flexible pipe shall be in accordance with **Subsection 301.03.11B**.

401.03.07C AIR TESTING

401.03.07C1 Standard Air Testing

Standard air testing shall be in accordance with **Subsection 301.03.11C1**.

401.03.07C2 Joint Air Testing for Pipe Diameters Greater than 35-Inches

Joint air testing for pipe diameters greater than 35-inches shall be in accordance with **Subsection 301.03.11C2**.

401.03.07D TELEVISION INSPECTION OF STORMWATER LINES

TV inspections of stormwater lines will be in accordance with **Subsection 301.03.11D**.

401.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

401.04.01 STORMWATER PIPE

Measurement and payment for stormwater pipe, including culverts and pipe stub-outs from manholes, will be made on a lineal foot basis for the various classes, types, and sizes of pipe listed in the Contract Documents and as actually installed. All pipe will be measured horizontally from center-to-center of manholes or to the ends of the pipe, whichever is applicable. No deductions will be made for fittings or for structures.

Payment shall constitute full compensation for the pipe in-place, including trench excavation, furnishing, placing and compacting pipe bedding, pipe zone material, and native backfill material, testing, and plugs.

401.04.02 CLOSURE COLLARS

Measurement and payment for closure collars will be made at the unit price each as shown in the Contract Documents and actually constructed. Payment shall include full compensation for all materials, equipment, and labor necessary to complete the work. If not listed in the Contract Documents, then they will be considered incidental to the other work.

401.04.03 FIELD FABRICATED CONNECTIONS

Measurement and payment for field-fabricated connections will be made at the unit price each for the type and size as shown in Contract Documents. Payment shall include full compensation for all materials, equipment, and labor necessary to complete the work. If not shown in the Contract Documents, then they will be incidental to the other work.

402 MANHOLES, INLETS, AND CONCRETE STRUCTURES

402.01 DESCRIPTION

This section covers the work necessary for the construction of the following items:

A. Manholes

B. Drywells

C. Inlets and catch basins

D. Concrete encasement

402.02 MATERIALS

402.02.01 BASE ROCK

Base rock requirements shall be in accordance with **Subsection 302.02.01**.

402.02.02 Forms

Form requirements shall be in accordance with **Subsection 302.02.02**.

402.02.03 Concrete and Reinforcing Steel

Concrete and reinforcing steel shall conform to **Section 205**.

402.02.04 Cement Mortar

Cement mortar requirements shall be in accordance with **Subsection 302.02.04**.

402.02.05 Manholes

402.02.05A Standard Precast Manhole Sections

Standard precast manhole sections shall conform to the requirements of **Subsection 302.02.05A**.

402.02.05B Precast Concrete Bases

Precast concrete bases shall conform to the requirements of **Subsection 302.02.05B.**

402.02.05C Poured-in-place Manhole Bases

The Contractor may use poured-in-place manhole bases only over existing stormwater pipes. Concrete shall conform to **Section 205**.

402.02.05D Manhole Grade Rings

Manhole grade rings shall conform to **Subsection 302.02.05D**.

402.02.05E Jointing Materials

Manhole jointing materials shall conform to **Subsection 205.02.09D.**

402.02.05F Manhole Steps

Manhole steps shall comply with **Subsection 302.02.05F**.

402.02.06 Pipes and Fittings

Conform to requirements of **Section 401**.

402.02.07 Precast Inlets and Catch Basins

Precast base and extension units shall conform to ASTM C913 and shall be used in the construction of all inlets. Concrete risers for extensions shall be a minimum of 4-inches in height and shall be the same quality as the main section. All catch basins shall be poured-in-place. Precast catch basins are prohibited.

402.02.08 Manhole Frames and Covers

Manhole frames and cover requirements shall be in accordance with **Subsection 302.02.06**.

402.02.09 Standard Frames and Grates for Inlets and Catch Basins

Frames and grates for catch basins and inlets shall be fabricated of steel conforming to ASTM A36 in accordance with the Standard Details. All connections shall be welded. Welding shall conform to requirements of current code for welding in building construction of the American Welding Society. Frames and gratings shall be tested, one within the other, and there shall be no more than

1/16-inch rock. When checked by a test jig, the bearing seat of either component shall have no more than 1/16-inch rock. Test jibs shall be furnished by the manufacturer.

402.02.10 Sedimentation Manhole and Drywell Systems

The precast sections shall comply with **Subsection 302.02.05**. The frame and cover shall comply with **Subsection 302.02.06** and shall be tamper-proof when the system is located in unpaved areas.

***Drain Rock**:* Drain rock shall be 2-inches to 4-inches in size, clean, round, imported material. When 2-inch to 4-inch size is unavailable, drain rock shall be 2-inches in size, clean, round, imported material with each precast perforated drywell section encased with Type III or IV polyethylene netting.

***Polyethylene Netting**:* Netting shall be in accordance with ASTM D1248. Netting shall meet the following specifications:

A. 1.5% carbon black

B. Tensile strength of 300 lbs./ft., per ASTM D5034

C. 0.50-inch openings

402.02.11 Drop Assemblies

Drop assemblies are only required when specified by the Engineer. Drop assemblies shall conform to the requirements of **Subsection 302.02.08.**

402.02.12 Beehive Inlets

The precast sections shall be standard class III reinforced concrete pipe and shall comply with **Subsection 301.02.02**. The manhole frame shall be reversible and shall comply with **Subsection 302.02.06**. The beehive grated cover shall be cast iron with materials conforming to ASTM A48 Class 30 specifications. Beehive grated cover shall be attached to the precast concrete pipe section with 54" of 1/8" – 3/16" diameter stainless steel wire rope made up of 7 strands of #19 wire.

402.03 Construction

402.03.01 General

402.03.01A Excavation and Backfill

Conform to applicable provisions in **Section 206**. Backfill around manholes, inlets, catch basins, and other appurtenances shall be of the same type as the trench backfill immediately adjacent.

402.03.01B Base Rock

Place crushed aggregate base rock and thoroughly compact with a mechanical vibrating or power tamper.

402.03.01C Foundation Stabilization

If material in bottom of excavation is unsuitable for supporting manholes and other stormwater appurtenances, excavate below subgrade as directed and backfill to required grade with rock conforming to Foundation Stabilization in **Subsection 206.03.07**.

402.03.02 Manholes

Manhole requirements shall conform to **Subsection 302.03.02**, except that manholes will only need to be vacuum tested as specified in **Subsection 402.03.06**.

402.03.03 Pipe Stub-outs from Manholes

Pipe stub-outs from manholes shall be installed in accordance with **Subsection 302.03.04**.

402.03.04 Manhole Grade Rings

Manhole grade rings shall be installed in accordance with **Subsection 302.03.05**.

402.03.05 Manhole Frames and Covers

Manhole frames and covers shall be installed in accordance with **Subsection 302.03.06**.

402.03.06 Vacuum Testing

When required by the Contract Documents, or when the groundwater is too low to permit visual detection of leaks, or when the quality of materials used or workmanship performed during the construction of stormwater facilities are in doubt for any reason, the Engineer may require the stormwater line and all applicable appurtenances to be tested. When so ordered, the manholes shall be required to pass tests as specified in **Subsection 302.03.07**.

402.03.07 Concrete Encasement

Concrete encasement shall conform to requirements in **Subsection 302.03.08**.

402.03.08 Installation of Inlets and Catch Basins

Install inlets and catch basins at the locations shown on the plans and in accordance with **Subsection 4.05.03**.

Construct inlets and catch basins as shown on the Standard Details.

Set frames and grates at elevations shown or as directed. Frames shall be cast in concrete. Bearing surfaces shall be clean and provide uniform contact. Anchor bolts and other fastenings shall be firmly embedded in concrete.

Any surrounding structures (e.g., pavement, curbs, gutters, sidewalks, driveways) and landscaping damaged during installation of inlets or catch basins shall be restored in accordance with the Standard Specifications at no expense to the City.

402.03.09 Inlet Extensions

Install extensions to height as required. Use the largest size (in height) pre-cast extension risers available from the manufacturer that will allow for conformance with the specified finished grade. Stacking small pre-cast extensions where a larger extension could be used is prohibited. Lay risers in mortar with sides plumb and tops to grade. Joints shall be sealed with mortar with interior and exterior troweled smooth. Prevent mortar from drying out and cure by applying an approved curing compound or other approved method. Extensions shall be watertight.

402.03.10 Manhole Steps

Steps shall comply with requirements of **Subsection 302.03.10**.

402.03.11 CLEANING

Upon completion, clean each structure of all silt, debris, construction-related sediment, and foreign matter.

402.03.12 SEDIMENTATION MANHOLE AND DRYWELL SYSTEMS

Precast sedimentation manhole and drywell systems shall be constructed in conformance with the Standard Details. Maximum depth of drywells shall not exceed 30-feet as measured from the manhole rim and shall not be less than 20-feet unless approved by the Engineer.

Precast perforated drywell sections encased with HDPE netting shall have the HDPE netting overlap a minimum of 1-foot. Netting shall be banded in 3 locations per manhole section with ¾-inch steel bands. The first band shall be located above the weep hole openings; the second shall be located at mid-section; and the third shall be located below the weep hole openings.

402.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

402.04.01 MANHOLES

Measurement and payment for manholes will be made on a unit price basis for each type shown in the Contract Documents for manholes 0 to 6-feet deep, plus the unit price per foot shown in the Contract Documents for extra depth of manholes over 6-feet. No deduction will be made for depths less than 6-feet. Measurement of manhole depth will be from the top of the manhole frame and cover to the manhole invert at the center of the manhole to the nearest 1/10-foot. Payment shall include full compensation for all materials, labor, steps, and equipment required to construct manhole complete-in-place.

402.04.02 TAMPERPROOF AND WATERTIGHT MANHOLE FRAMES AND COVERS

Measurement and payment for tamperproof manhole frames and covers shall be considered as incidental to the construction of manholes and no separate payment shall be made.

402.04.03 CONCRETE ENCASEMENT

Measurement and payment for concrete encasement will be made on a lineal foot basis as shown in the Contract Documents for the size pipe to be encased. Length shall be measured along the centerline of the pipe. Payment shall include full compensation for all materials, equipment, and labor required to construct the work complete-in-place.

402.04.04 CATCH BASINS AND INLETS

Measurement and payment for catch basins and inlets will be made on a unit price basis, per each catch basin or inlet, for the number and type actually constructed. Payment shall include full compensation for all materials, equipment, and labor required to construct the work complete-in-place, including the replacement of any surrounding structures damaged during construction.

402.04.05 SEDIMENTATION MANHOLE AND DRYWELL SYSTEMS

Measurement and payment for precast sedimentation manhole and drywell systems will be made on a unit price basis per each line item in the Contract Documents. Payment shall include full compensation for all materials, equipment, and labor required to construct the work complete-in-place, including the replacement of any surrounding structures damaged during construction.

402.04.06 Other Items

Measurement and payment for other items not specified above shall be made at either the unit price or lump sum basis for each bid item as shown in the Contract Documents or shall be incidental for work not listed in the Contract Documents. Payment shall be full compensation for all materials, equipment, and labor necessary to complete the work.

403 Work on Existing Stormwater Drainage Structures

403.01 Description

This section covers the work necessary to join new work to existing, the abandoning of stormwater lines and structures, and adjusting existing utility structures to finished grades, and shall include the requirements of **Sections 401 and 402** unless otherwise modified herein.

403.02 Materials

Conform to requirements of **Section 205** and to the requirements for related work referred to herein.

403.03 Construction

403.03.01 Excavation and Backfill

Conform to requirements of **Section 206**.

403.03.02 New Manholes Over Existing Stormwater Lines

New manholes over existing stormwater lines shall conform to the requirements for wastewater systems of **Subsection 303.03.02**, except that manholes will only need to be vacuum tested as specified in **Subsection 402.03.06**.

403.03.03 Removal of Existing Pipes, Manholes, and Appurtenances

Removal of existing pipes, manholes, and appurtenances shall conform to the requirements of **Subsection 303.03.05**. Filling, removing, and/or abandoning of drywells shall be per approved DEQ procedures and permits.

403.03.04 Filling Abandoned Structures

Filling abandoned manholes, inlets, drywells and catch basins shall conform to the requirements of **Subsection 303.03.06**.

403.03.05 Existing Manhole Frames and Covers

Requirements for existing manhole frames and covers shall be according to **Subsection 303.03.07**.

403.03.06 Permanent Plugs

Requirements for permanent plugs shall be according to **Subsection 303.03.08**.

403.03.07 Adjusting Existing Structures to Grade

Existing manholes, inlets, catch basins, and similar structures shall be brought to the specified finished grade by methods of construction as required in **Section 610**.

403.03.08 Reconstruct Manhole Base

Reconstruct manhole bases in accordance with requirements of **Subsection 303.03.10**.

403.03.09 Connect to Existing Structures

Provide all diversion facilities and perform all work necessary to maintain flow in existing lines during connection. Breakout existing base or sawcut opening in wall with concrete saw. Grout in new pipe to provide watertight seal and, when applicable, smooth flow into and through existing manhole as specified in **Subsection 303.03.10**. Connect pipes to existing structures in accordance with requirements of **Subsection 303.03.11**.

403.03.10 Drywell Protection

When a drywell is encountered, the Contractor will take all precautions to protect the structure and replace all disturbed structures and materials to their original condition.

403.03.11 Sedimentation Manhole and Drywell System Retrofits

Conform to applicable requirements of **Sections 205 and 206**. Precast sedimentation manhole and drywell systems shall be constructed in conformance with the Standard Details, and applicable requirements for Sedimentation Manhole and Drywell Systems of **Sections 402 and 403** herein.

403.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

403.04.01 New Manholes Over Existing Stormwater Lines

Measurement and payment for new manholes over existing stormwater lines will be made at the unit price for each. Payment will include compensation for excavation and backfill, constructing new manhole over existing line (complete-in-place), final adjustment to grade, maintaining flow, and forming new flow channel.

403.04.02 Removal of Existing Pipes, Manholes, and Appurtenances

Payment for removal and disposal of existing pipes, manholes, and appurtenances will be considered as incidental to the work and included in the bid item for excavation and backfill as specified in **Section 206**.

403.04.03 Filling Abandoned Structures

Measurement and payment for filling abandoned structures will be made on a unit price each basis.

403.04.04 Adjusting Existing Structures to Grade

Measurement and payment for adjusting existing manholes, catch basins, inlets, and similar structures will be made on a unit-price-each basis for the type shown in the Contract Documents. If no item is included in the Contract Documents for “adjust existing structures to grade”, all costs will be considered incidental work for which no separate payment will be made.

403.04.05 Reconstruct Manhole Base

Measurement and payment for reconstructing manhole base will be made on a unit-price-each basis. If no item is included in the Contract Documents for “reconstruct manhole base”, all costs will be considered incidental work for which no separate payment will be made.

403.04.06 Connect to Existing Structures

Measurement and payment for connection to existing structures will be made on a unit price each basis. If no item is included in the Contract Documents for “connection to existing structures”, all costs will be considered incidental work for which no separate payment will be made.

403.04.07 Drywell Protection

Measurement and payment for drywell protection will be made on a unit-price-each basis if shown in the Contract Documents. Compensation will be for all materials, labor, and equipment necessary to protect the structure or bring the structure equal to its original undisturbed condition.

If no item is included in the Contract Documents for “drywell protection”, all costs will be considered incidental work for which no separate payment will be made.

403.04.08 Sedimentation Manhole and Drywell System Retrofits

Measurement and payment for retrofit of sedimentation manhole and drywell systems will be made on a unit price basis per each line item in the Contract Documents. Payment shall include full compensation for all materials, equipment, and labor required to construct the work complete and in-place, including the replacement of any surrounding structures damaged during construction.

403.04.09 Other Items

Measurement and payment for other items not specified above shall be made at either the unit-price or lump-sum basis for each bid item as shown in the Contract Documents or shall be incidental for work not listed in the Contract Documents. Payment shall be full compensation for all materials, equipment, and labor necessary to complete the work.

End of Chapter

CHAPTER 500 - WATER TECHNICAL REQUIREMENTS

500 GENERAL

The following specifications, in conjunction with applicable requirements of other parts of the Contract Documents, the Plans, and Addenda, shall govern the character and quality of material, equipment, and construction procedures for water work. All work done shall be in compliance with the requirements and restraints of the Occupational Safety and Health Administration (OSHA), the State of Oregon Accident Prevention Division regulations, and the Workers' Compensation Board. In addition, all work shall be completed in conformance with State of Oregon, Multnomah County, City of Portland and/or City of Gresham street opening permits.

501 PIPES, FITTINGS AND VALVES

501.01 DESCRIPTION

This section covers, but is not limited to, the following work:

A. Water pipe for water mains and water services

B. Fittings

C. Valves

D. Tracer Wire

501.02 MATERIALS

If the system in the area is at a higher than normal operating class, the Engineer may require higher pressure rating materials.

501.02.01 FLANGED OR SPOOL DUCTILE IRON PIPE

Flanged pipe or spools shall conform to the latest edition of ANSI/AWWA C115/A21.15. Flanges shall conform to requirements as specified in **Subsection 501.02.01A**. Pipe used shall be Class 53 Ductile Iron. Pipe shall be furnished with coatings as specified in **Subsection 501.02.02**. Threads on the flanges and pipe barrel shall be taper pipe threads (NPT) in accordance with ANSI B1.20.1.

Manufacturer shall provide the following information: length and weight shown on each pipe, flange manufacturer marking, country where cast, and ductile iron or cast iron stamped on flanges. If fabricator is other than flange manufacturer, fabricator's mark shall be stamped with metal die on each flange after assembly. Also, manufacturer shall provide statement that the flange pipe complies with the specified standards.

501.02.01A JOINTS FOR FLANGED OR SPOOL DUCTILE IRON PIPE

Flanges shall conform to ANSI Specification B16.1 for Class 125 flanges and shall conform in all other respects to ANSI/AWWA C110/A21.11. Bolts for assembly of flanged joints shall be of the size and quantity shown in the latest version of AWWA C110. As stated in AWWA C110, bolts shall conform to ANSI B18.2.1, Square and Hex Bolts and Screws Inch Series, Including Hex Cap Screws and Lag Screws. Nuts shall conform to ANSI B18.2.2, Square and

Hex Nuts. Threads shall conform to ANSI B1.1, Standard for Unified Inch Screw Threads (UN and UNR Thread Form), Class 2A external and Class 2B internal.

Bolts and nuts shall be of low-carbon steel conforming to the requirements of ASTM A307, Grade B. All buried flange nuts and bolts shall receive a protective coating of an approved spray-on, auto-body asphalt undercoating. Protective coating shall be dried and cured before fitting is placed and covered.

Contractor shall provide the Project Manager with the manufacturer's specifications regarding the bolts to be used on the project.

Flange gaskets shall be ring-type, 1/8-inch thick, red rubber as specified. Full-face gaskets shall not be used.

501.02.01B Fittings For Flanged Or Spool Ductile Iron Pipe

Flanged pipe or spool fittings shall conform to **Subsection 501.02.02B**.

501.02.02 Push-On Ductile Iron Pipe

Ductile iron pipe shall be Class 52. Physical properties shall not be less than ASTM Grade 60-42-10 iron and pipe shall conform to the latest revision of ANSI/AWWA C151/A21.51. Ductile iron pipe shall be factory lined with cement mortar and bituminous seal coat and coated outside with asphaltic seal coat. Push-on rubber gasket joint pipe shall be U.S. Pipe's TYTON joint or American's Fastite joint or approved equal.

501.02.02A Joints For Push-On Ductile Iron Pipe

For all pipes, pipe shall be restrained using FIELD LOK gaskets as manufactured by the U.S. Pipe; Fast-Grip gaskets as manufactured by American Cast Iron Pipe Company; or, TR FLEX joint pipe or approved equal. Series 1100HD Restraint Harness as manufactured by EBAA Iron Sales, Inc.; MJ/TJ or THRUST-LOCK joint with "Megalug" retainer glands as manufactured by the Pacific States Cast Iron Pipe Company is approved when external pipe restraint is required or when specified by the Engineer.

Mechanical joints (MJ), in addition to accessory glands, gaskets, and bolts, shall conform to the requirements of ANSI/AWWA C111/A21.11, except where specifically modified in ANSI/AWWA C153/C21.53 for compact ductile iron fittings. As stated in AWWA C111, T-bolts shall be made of either ductile iron or Cor-Ten type, or approved equal. Bolts shall be marked to identify material and producer. Contractor shall provide the Project Manager with the bolt manufacturer's specifications that shall give the following information: manufacturer's name, type of material, and identifying mark.

Mechanical joint gaskets shall be made of vulcanized synthetic rubber and shall be manufactured no earlier than the year prior to installation.

The recommended installation procedures in AWWA C111, Appendix A, "Mechanical-Joints Bolts, Gaskets, and Installation", including bolt torque ranges, shall be followed.

Retainer glands for mechanical joints shall be "Megalug" series as manufactured by EBBA Iron Sales, Inc., RomaGrip as manufactured by Romac Industries, Inc or approved equal. Restrained mechanical joints shall be used on all fittings.

501.02.02B Fittings For Ductile Iron Pipe

All fittings shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. All cast iron fittings and flanged ductile iron fittings shall be Class 250 and all ductile iron

mechanical joint fittings shall be Class 350. Fittings shall be furnished with flanged or mechanical joints as specified on the plans. Fittings shall be furnished with a standard outside coating and a cement mortar lining with bituminous seal coat conforming to ANSI/AWWA C104/A21.4. Fittings shall be factory lined with cement mortar or cement lined to factory standards. No field coating with cement will be approved other than for minor repairs as approved by the Engineer. Fittings shall be new and free of defects in coating, body, and lining. During installation, fittings shall be properly aligned and bolted securely to provide watertight joints.

Fittings shall be manufactured by Griffin, Tyler Union, U.S. Pipe, or approved equal.

501.02.03 Polyvinyl Chloride (PVC) Water Pipe

PVC pipe shall only be used where approved by the Engineer. PVC pipe shall conform to the Standards of AWWA C909 (C900 and C905 may be approved on a case by case basis) and Uni-Bell pressure pipe. All PVC pipe shall have a pressure class not less than 235, with an outside diameter identical to ductile iron. Sand shall be used in pipe zone around PVC. Tracer wire shall conform to **Subsection 501.02.07**.

501.02.03A Fittings For PVC Pipe

Fittings for PVC pipe shall conform to **Subsection 501.02.02B**.

501.02.04 Copper Pipe

1-inch service lines shall be soft temper Type K, copper water tube, meeting ASTM B88. 2-inch service lines shall be (hard) drawn temper, Type K, meeting ASTM B88.

501.02.04A Brass Fittings For Copper Pipe

501.02.04A1 Corporation Stops

3/4-inch or 1-inch corporation stops shall be Mueller B-25008N or approved equal. 2-inch corporation stops shall be Mueller B-2969N or approved equal.

501.02.04A2 Angle Meter Stops

1-inch Angle meter stops shall be Mueller B-24258N (110 Compression) or approved equal. 2-inch shall be Mueller B-24276 2 (110 Compression) or approved equal.

501.02.04A3 Meter Yoke (Setter)

2-inch meter yoke (setter) shall be Mueller B-2423-99000N or approved equal.

501.02.04A4 Copper Unions

Three-part copper-to-copper union shall be Mueller H-15403N (110 Compression) or approved equal.

501.02.04A5 Copper Couplings

Straight couplings, copper to inside iron pipe thread, shall be Mueller H-15451N (110 Compression x F.I.P.) or approved equal. Straight couplings, copper to outside iron pipe threads, shall be Mueller H-15428N (110 Compression), or approved equal.

501.02.05 PEXa Pipe

PEXa pipe may by used for 1-inch and 2-inch service lines and shall be crosslinked polyethylene, produced in accordance with AWWA C904, manufactured by Rehau Municipex or approved equal.

501.02.05A FITTINGS FOR PEXA PIPE

Fittings for PEXa pipe shall conform to **Subsection 501.02.04A**.

501.02.06 VALVES

Direct-buried line valves of 12-inch size and larger shall be butterfly valves. All smaller, direct-buried line valves shall be gate valves. All valves shall be designed to AWWA specifications and shall have standard 2-inch-square operating nut unless otherwise shown on the plans. All valves shall open counter clockwise when viewing valve from above.

501.02.06A GATE VALVES

Gate valves 2-inches through 10-inches shall be resilient-wedge (RW), non-rising stem with "O" ring packing, complying with AWWA C509 or C515. The valves shall be designed to withstand water-working pressures of 250psi or more. Valves shall be coated inside and out with epoxy coating complying with AWWA C550.

Operation of the valve shall permit full withdrawal of the disc from the waterway to provide a clear, unrestricted passage when the valve is in the open position. The valve shall be furnished with joint ends as specified on the plans. Where flanges are furnished on valves, they shall conform to ANSI B16.1, Class 125.

Specified gate valves shall be Mueller, U.S. Pipe, Clow, M&H, Kennedy, American Cast Iron Pipe Company, or approved equal.

501.02.06B BUTTERFLY VALVES

All butterfly valves shall be resilient, rubber-seat type conforming to AWWA C504 Class 150B and bubble-tight at 150psi pressure with flow in either direction. They shall be designed for direct burial and be satisfactory for application involving valve operation after long periods of inactivity. All valves shall be Mueller, U.S. Pipe, Clow, Pratt, M&H, Kennedy, American Cast Iron Pipe Company, or approved equal. Operating nut for the valve shall be located on the side of the main shown on the plans.

501.02.07 WATER LINE MARKERS

Plastic water line markers shall be 6-feet long, blue plastic, Carsonite Model CUM-375 with label No. CW-112 or approved equal. Markers for paved easement areas shall be brass surveyor's monument caps inscribed with the words, "CAUTION: BURIED PUBLIC WATER LINE. CALL FOR LOCATES BEFORE DIGGING."

501.02.08 TRACER WIRE

Tracer wire for locating mains and services shall be 12-gauge tin coated solid copper with blue HDPE outer jacket. All wire, connectors and splices shall be Neptco Trace-Safe or approved equal. When grounding a wire to an existing iron main, 12-gauge tin coated solid copper wire shall be thermite welded to the main with Erico CADWELD or approved equal.

Tracer wire shall be laid on top of the water line, or as directed by the Engineer. Wire shall be continuously conductive. Wire shall be insulation-coated and brought to the surface at locations shown on the plans. Wire shall be brought into a valve box through a 1-inch conduit. The conduit shall be buried at least 2 feet below the dirt line and shall extend to approximately 6-inches above the dirt line. Tracer wire shall be threaded through a glue-on conduit cap and shall end with a Trace-Safe locate clip or approved equal. A minimum of 2 feet of excess wire shall be provided between the conduit cap and locate clip. See **Standard Detail 517, Locate Wire Box**.

501.02.09 Polyethylene Encasement

Polyethylene film shall conform to ASTM D4976 and AWWA C105, Method A, having a minimum thickness of 0.008-inch (8 mil). Only polyethylene tubing matching the pipe diameter shall be installed. Sheet material shall not be used.

Polyethylene tubing shall be held in place with 2-inch wide adhesive tape that is compatible with polyethylene, with plastic binder twine, with nylon tie straps, or other method approved by the Engineer.

501.02.10 Tapping Sleeve And Valve

Tapping sleeve shall be JCM Model No. 432 or Mueller Catalog No. H-304 furnished with Class 125 ANSI B16.1 stainless steel outlet flange. Valve shall be mechanical joint by flange, Mueller Resilient Wedge Gate Valve No. A-2361 or approved equal.

501.03 Construction

501.03.01 Placing And Blocking Pipes And Fittings

The pipe shall be laid true to line, without objectionable breaks in grade, and shall be firmly bedded with 6-inches of ¾”-0” crushed rock for the entire length of the pipe.

Where conflicts arise between the designed grade of the water line and an existing underground structure, the depth of the trench may be increased to permit proper installation of the water line.

Care shall be taken to clean joints and to keep them free of water during construction. Whenever water is excluded from the interior of the pipe, adequate backfill shall be deposited on the pipe to prevent floating. In the event of any flotation occurring, the pipe so affected shall be removed from the trench, replaced, and re-laid at the Contractor's sole expense.

Each section of the pipe and each fitting and valve shall be clean before it is lowered into the trench. Cleaning of each pipe or fitting shall be accomplished by swabbing out, brushing out, or blowing out with compressed air, or washing to remove all foreign matter. The most adequate method of cleaning out pipe and fittings will be determined on the job by the Inspector.

If clean pipe sections and fittings cannot be placed in the trench without getting dirt into the open ends, the Inspector may require that a piece of tightly woven canvas be tied over the ends of the pipe or fitting until it has been lowered into position in the trench. After the pipe or fitting has been lowered into the trench, all foreign matter shall be completely brushed from the bell and spigot ends before assembly. At the end of each day or during suspension of the work, the pipe ends shall be securely closed by means of a secure plug or approved equivalent. Water in the trench shall not be allowed to enter the pipe and fittings.

All tees, elbows, and any major changes in direction of pipe alignment shall be secured using mechanical restraint. If thrust blocks or straddle blocks are required, pursuant to **Subsection 5.01**, all pipe and fittings in contact with concrete shall be completely wrapped in 2-layers of 8-mil plastic prior to the placement of the concrete. Concrete used for thrust and straddle blocking shall have a slump of 2-inches to 4-inches and a minimum 28-day strength of 3300psi. Concrete mix shall be uniformly blended with appropriate quantity of water before being placed in the trench and shall not contain any dirt or other foreign matter. Thrust blocks shall be formed so that fitting joints and bolts remain accessible. Blocks that are to be removed in future water line extensions shall be supplied with a rebar-pulling loop and formed so that the block may be pulled off without disturbing the fitting. See **Standard Detail 507, Horizontal Thrust Blocking, Standard Detail 508, Vertical Thrust Blocking and Standard Detail 509, Straddle Block**. Water pressure shall not be applied to

the water line for a minimum of 48-hours after placement of thrust and straddle blocks. All concrete shall be subject to sampling and testing as directed by the Engineer.

If it is necessary to cut the pipe to lay it on curves or to cause a change in direction, the Contractor shall cut the pipe as required for proper installation. Where the cut length of pipe is to be installed into the bell end of another pipe, the cut end shall be beveled to ensure a proper seal. To set valves and fittings properly, the pipe shall be cut to the exact length required to obtain the designated locations.

In all areas where PVC pipe is installed, tracer wire shall be installed per **Subsection 501.03.06**.

Pipelines crossing a sanitary sewer line shall be treated as outlined on **Standard Detail 510, Gravity Sanitary Sewer, Water Line Separation,** as directed in the field by the Inspector and according to Oregon Department of Human Services (Oregon Administrative Rules Chapter 333).

All dead end lines require a standard 2-inch, 4-inch or 6-inch blow-off assembly. This will allow for flushing and release of line pressure during future water line extension.

501.03.02 Polyethylene Encasement Of Pipe And Fittings

When specified, install polyethylene encasement, tube type, on all pipe and appurtenances. Polyethylene film shall conform to **Subsection 501.02.08**. Install one length of polyethylene tube for each length of pipe. The use of polyethylene sheets will not be allowed. Sand backfill shall be placed within the pipe zone and bedding area wherever polyethylene encasement is used.

Cut tubing open if necessary to wrap valves and fittings. Valves shall be wrapped up to the bottom of the operating nut. Polyethylene shall be wrapped snugly around the pipe and held in place by using an adhesive tape compatible with polyethylene, plastic binder twine, or nylon tie straps. Backfill material shall not be allowed to get under the polyethylene and pockets in the polyethylene that can trap backfill material shall be eliminated.

501.03.03 Placing Valve Units

A valve unit shall consist of a valve, bolts, gaskets, followers, PVC riser pipe, and “Vancouver” style cast iron valve box and lid.

Valves shall be placed in a vertical position at locations shown on the plans. The Contractor shall check each valve to determine that the valve is properly adjusted to seat securely and open fully. Valves not meeting these requirements shall not be installed. Valve boxes and PVC riser pipe shall be placed in a vertical position centered over the valve operating nut and the backfill shall be carefully compacted around the box. Any valve boxes found off center from the valve-operating nut shall be removed and replaced into the proper position. The top of the valve box shall be adjusted to meet finish grade.

The Contractor shall not operate any valve touching potable water unless authorized by the City Water staff.

501.03.04 Water Service Line Installation

Where indicated on the drawings or as determined in the field by City Water Operations personnel, the Contractor shall install water service lines prior to the main line being connected to the City’s water system. The Contractor is required to make all taps for the service, install new copper or PEXa pipe, and install either 1-inch corporation stops or 2-inch gate valves. See **Standard Detail 502, 1” Water Service and Standard Detail 503, 2” Water Service (1 1/2”-2” Meter)**.

All direct taps made to the water line for 1-inch corporation stops shall be made with a tapping bit with cc threads and with a machine designed for that purpose.

Where a new 1-inch service line is to be installed at the existing meter location, the new angle meter stop shall be set near the same elevation as the existing angle meter stop a maximum of 2 inches away from connection point on the existing meter, unless specified otherwise by the City. All new pipe and service fittings shall be kept clean and free of debris. City Water Operations personnel will make connection of new angle meter stop to existing meter, only to include removal of the existing angle meter stop, connection to the new angle meter stop, and flushing the new service. Any extra time and materials required due to the Contractor's negligence shall be recorded and charged to the Contractor. A new meter box will be installed by Contractor on all new services.

New meter boxes shall be set with the top of the box at finish grade. The longest dimension of the box shall be set perpendicular to the adjacent curb. Where an existing meter must be relocated, Contractor shall provide and install the new service, angle meter stop, and meter box, complete and adjusted to finished grade. City Water Operations personnel will install the meter and extend or shorten customer's service line on the customer's side of the meter. Where a meter is located within a traffic area, including driveways, aprons and all locations adjacent to streets with mountable curb, a traffic bearing meter box cover shall be supplied.

All copper and brass structures shall be bedded with ¾”-0” crushed aggregate to a depth of 6-inches on all sides and backfilled in accordance with **Standard Detail 502, 1” Water Service and Standard Detail 503, 2” Water Service (1 1/2”-2” Meter)**. The interior of the meter box shall be backfilled with soft earth, free of gravel and organic matter.

Service lines shall be located in a direct line between the main line and the meter, perpendicular to the curb. Typically, the meter shall be located 18-inches inside side lot line. The side lot line shall be projected perpendicular to curb. If that location conflicts with other facilities, the location shall be approved by the Engineer.

Where an existing service is to be transferred to new main, and the existing main is to remain live City Water Operations personnel shall disconnect corporation stop from old main and install a brass plug. Contractor shall provide excavation down to old corporation stop, install select backfill, and compact. On publicly financed improvement projects the Contractor shall perform surface restoration according to the bid item for that work. Transfer of service to new main shall be performed by City Water Operations personnel once new water line is tested and accepted. The Contractor shall provide new corporation stop in new main in line with existing service.

Existing galvanized service lines encountered by the Contractor shall be entirely replaced with new service pipe up to and through the angle meter stop.

All new services crossing existing metal gas lines or other cathodically protected systems shall have PVC sleeves as shown on **Standard Detail 502, 1” Water Service and Standard Detail 503, 2” Water Service (1 1/2”-2” Meter)** or shall be PEXa pipe.

Corporation stops shall be installed at a 45º angle from the horizontal centerline of the main. The operating nut shall be at 3 or 9 o’clock and parallel to the main centerline. Taps shall be a minimum distance of 18-inches from the bell or spigot end of the main, a fitting, or another service tap.

Where a new section of 1-inch copper service is to be installed, it shall be Type K seamless soft-annealed copper pipe conforming to ASTM B88. 2-inch copper shall be Type K rigid pipe conforming to ASTM B88. For 1-inch services, there shall be no splicing of copper unless service is longer than 100-feet or as approved by the Engineer. When splicing is approved between 2 pieces of copper, it shall be done with a 3-piece, copper-to-copper compression union. No more than 1

splice per service shall be made and splicing shall be made outside of the existing or proposed travel lane.

No kinks, dents, abrasions, or deformations will be allowed. If any are discovered in copper, the entire length of copper shall be replaced at the Contractor's expense.

PEXa pipes shall conform to AWWA C904. There shall be no splicing of PEXa services. If deformations in PEXa cannot be repaired with use of a heat gun, the entire length of PEXa shall be replaced at the Contractor's expense.

Each service shall be visually inspected by the Inspector upon completion, prior to backfilling.

Where 2-inch services for 1½-inch and 2-inch meters are to be installed, the new main shall be tapped 2-inches, a double strap 2-inch F.I.P. service saddle, 2-inch brass M.I.P. nipple, 2-inch RW F.I.P. gate valve and Mueller H 15428N M.I.P. x 110 Compression adapter installed, 2-inch copper or PEXa tubing and 2-inch meter setter shall then be installed to the new meter location. Where meter box is located in any portion of a driveway or apron, or any other traffic area, a traffic-bearing box and cover shall be used. See **Standard Detail 503, 2" Water Service (1 1/2"-2" Meter)**.

Once the new services are installed by the Contractor and the new water line facilities are pressure tested, chlorinated, and accepted, City Water Operations personnel shall install the new or replaced meters and replumb the service. It shall be the responsibility of the Contractor to coordinate meter installation with the Inspector. Placement of new sidewalks or other surface restoration shall not take place until meters and tailpieces have been installed.

501.03.05 Placing Water Line Markers

Install permanent flexible water line markers per **Subsection 501.02.06** above the centerline of the water pipe wherever the water line lies in an easement or off-road area. Install markers spaced a maximum of 200-feet apart, at all changes in direction of the water line, at each crossing with the public right-of-way line, at blow-offs as shown on the plans, and directed by the Engineer. Install flat side of marker perpendicular to centerline of water line. Install marker in a plumb position with 2-feet buried and 4-feet exposed. In paved areas in easements, brass surveyor's monument caps shall be permanently installed in the pavement in lieu of the plastic markers.

501.03.06 Tracer Wire

Copper tracer wire is required on all non-metallic piping and to assist in locating water lines in easements, off-road areas, and road areas on transmission water mains where there are few or no services. Tracer wire shall be provided in lengths sufficient so that no splices will be required. Install copper tracer wire in the trench directly on top of the pipe, or as directed by the Engineer, for the entire length of the water line. In off-road areas, wire shall be brought vertically to the surface at 400-foot intervals and fastened to the plastic water line marker. A ¼-inch galvanized bolt and nut shall be installed in a ⅜-inch hole drilled in the marker l-foot above the ground surface. The tracer wire on each side shall be looped twice around the bolt and a 1-foot piece of free wire left on the end. Where the 400-foot interval falls in a paved area in an easement, the tracer wires shall be brought up into a meter box with traffic lid as described below.

For transmission water mains in road areas, provide and install a tracer wire station behind the curb at 400-foot intervals and as shown on the plans or directed by the Engineer. Tracer wire station shall consist of a meter box and lid, 1-inch PVC conduit to house the wire, and a copper wire connected to the main line wire with a splice per **Subsection 501.02.07**. From the top of the water pipeline, tracer wires shall be brought up vertically to a depth of 30-inches of cover, then run horizontally, perpendicular to the water line over to the meter box, and vertically into the box where a

2-foot length of wire ending in a locate clip shall be coiled. See **Standard Detail 517, Locate Wire Box.** Install minimum 1-foot radius sweep at each change of direction of the conduit. Allow sufficient slack in the wire that stress will not be placed on the wire during backfilling operations. A 4-inch thick concrete pad shall be installed around each tracing station box where not in sidewalk area. Pad shall measure a minimum of 12-inches from the outside of the box to the outside edge of the concrete pad.

501.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE FOR PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

501.04.01 INSTALLATION OF PIPE

Pipe installation shall include furnishing of pipe; water works materials required for proper installation; standard or restraint gaskets; pipe zone and bedding material; impervious dam material; transportation to the job site; all required excavation to the depth designated on construction plans; disposal of excavated materials not re-used; shaping the bottom of the trench for proper bedding of the pipe; wrapping with polyethylene encasement; cutting, placing, and testing pipe; furnishing chlorine or chlorine compounds; disinfection; flushing the pipe line; furnishing, placing, and removing thrust blocks, blow-off units, and temporary plugs and caps; ground water control; placing and compacting pipe zone, bedding, impervious dams and backfill material; and incidental traffic control. Where PVC pipe is installed, installation price shall also include tracer wire. Pipe installation shall also include providing and installing plastic or brass water line markers, copper tracer wire, and tracer wire stations.

Pipe installation shall be paid on a lineal foot basis and measured along the centerline of the pipe installed. The laying length of gate valves, fittings, and other appurtenances shall be included in the pipe centerline measurement. Payment shall constitute full compensation for the pipe in place, including furnishing, placing and compacting pipe bedding, pipe zone and backfill material. See **Standard Detail 214, Trench and Backfill** and **Section 206**.

501.04.02 FITTINGS FOR DUCTILE IRON PIPE

Payment for the cost of furnishing and installing cast iron and ductile iron fittings, in addition to that amount paid for the laying length of the fitting under the pipe item, shall be paid for on a per-each basis as listed in the Schedule of Prices. Payment shall include all accessories installed complete-in-place. Follower glands and mechanical restraint retainer glands are to be considered accessories and are not paid for separately.

501.04.03 WATER SERVICE LINE INSTALLATION

Water service line installation shall be paid on a per-each basis by size. The unit price quoted shall include furnishing all materials and work necessary to either transfer existing service or install new service pipe, tapping the new main, installing corporation stop or gate valve, and all other materials as shown on **Standard Detail 502, 1" Water Service and Standard Detail 503, 2" Water Service (1 1/2"-2" Meter)**. It shall also include excavation, boring, backfill, groundwater control, and other incidental work items complete-in-place.

501.04.04 SANITARY SEWER CROSSINGS

Centering a length of water pipe over each sanitary sewer crossing shall be considered incidental to construction and no additional payment shall be made.

Replacement of existing sanitary sewer lateral shall be paid on a per-each basis and shall include all excavation, piping, couplers, bends or fittings, connection to main, grouting, select backfill, and all work needed to replace the sanitary sewer lateral and install in-place. See **Standard Detail 510, Gravity Sanitary Sewer, Water Line Separation**.

502 APPURTENANCES

502.01 DESCRIPTION

This section covers the work necessary for the construction of the following items:

A. Fire Hydrant Assemblies

B. Blow-off Assemblies

C. Combination Air Valve Units

D. Corrosion Control Installation

E. Backflow Prevention Assemblies

502.02 MATERIALS

502.02.01 FIRE HYDRANT ASSEMBLY

Fire hydrants shall conform to AWWA C502. The hydrants shall have a 5¼-inch minimum valve opening with a 6-inch mechanical joint inlet, a 6-inch mechanical joint by flanged resilient wedge auxiliary gate valve, two 2½-inch hose nozzles, 1 to 4½-inch pumper port, a 1½-inch pentagon operating nut (opening counter clockwise) and a safety flange. The hydrant color shall be yellow, Sherwin Williams, GCC-5006, or approved equal. Fire hydrant shall be Mueller Super Centurion 250 only. See **Standard Detail 501(A-C)** for additional requirements.

The auxiliary valve shall be as described in **Subsection 501.02.06A** and be furnished complete with "Vancouver" valve box and accessories.

Fire hydrant shall have been manufactured no earlier than two years prior to installation.

The Storz adaptor shall be a 5-inch x 4.5-inch Harrington Permanent Hydrant Adaptor (HPHA), HPHA 50-45 NH/CAP with HBC 50 with national standard threads or approved equal.

Hydrants shall be marked with a 4-inch x 4-inch blue reflective raised pavement marker. Reflective markers shall be 3M 209-B two way blue or approved equal.

Polyethylene wrap shall conform to ASTM D2103 and AWWA C105, Method A, having a minimum thickness of 0.008-inch (8 mil).

502.02.02 BLOW-OFF UNITS

502.02.02A 2-INCH

2-inch blow-off units shall consist of cast iron or ductile iron MJ cap, brass nipple, RW gate valve, mechanical restraint assemblies, galvanized pipe and fittings, and "Vancouver" style valve box assemblies. See **Standard Detail 506A, 2" Blowoff Assembly**.

502.02.02B 4-INCH AND 6-INCH

4-inch and 6-inch blow-off units shall consist of a reducer, companion flange, RW gate valve, mechanical restraint assemblies, galvanized pipe and fittings, and "Vancouver" style valve box assemblies. See **Standard Detail 506B, 4" or 6" Blowoff Assembly**.

502.02.03 Combination Air Valve Unit

Combination air valve unit shall consist of a 2-inch double-strap service saddle, 2-inch brass ¼ bend (various end configurations), 2-inch RW gate valve (F.I.P. x F.I.P.), 2-inch brass nipples, 2-inch brass coupling (M.I.P. x Mueller 110 Compression), 2-inch ASTM B88 Type K rigid copper, 2-inch Val-matic #202C.2 or APCO #145C-2 combination air valve unit, 2-inch unions (Mueller 110 Compression), Brooks #65 meter box without pipe holes or approved equal, 12-inch concrete blocks, Hot Box EZ.75 EZ Box or approved equal and all other items as noted on **Standard Detail 505A, Combination Air Valve Unit and Standard Detail 505B, Combination Air Valve Notes**.

502.02.04 Water Quality Sampling Stations

Water quality sampling station shall consist of a ¾-inch ball valve, corporation stop , ¾-inch Type K soft temper copper tubing, ¾-inch M.I.P. x (110 Compression) quarter bend coupling Mueller H-15531N (110 Compression x MIP), ¾-inch ball valve Mueller B-25209N (110 Compression), Eclipse No. 88-SS Sampling Station (Kupferle Foundry) or approved equal, standard ”Vancouver” valve box assembly, ¾”-0" crushed rock backfill, and surface restoration as required. See **Standard Detail 504, Water Sampling Station**. See **Standard Detail 511, “Vancouver” Style Valve Box** for valve box detail. Re-coating paint shall be Miller Paint “Spray and Go-Hunter Green” #108 (ID #10013) or approved equal.

502.02.05 Corrosion Control Materials

502.02.05A General

Furnish catalog data for all corrosion control materials and obtain approval before ordering.

502.02.05B Exothermic Welds

Furnish molds, cartridges, and all required materials for exothermic (copper) welding as produced by Erico Products, Inc., or approved equal. Provide molds and cartridges as recommended in writing by the manufacturer. Use CADWELD F33 alloy or approved equal for connections to steel pipe. For connections to ductile iron pipe, CADWELD F33 alloy or approved equal may be used if field-testing indicates that it works adequately. Otherwise, use CADWELD XF19 alloy or approved equal. Welder molds shall be graphite; ceramic molds are not acceptable.

502.02.05C Gray Pad

Furnish gray pad as manufactured by Tapecoat or approved equal for protection of exothermic weld. Pads shall meet AWWA C209. Pads shall have a minimum thickness of 55-mils.

Furnish liquid primer to be applied to the pipe surface as supplied by the manufacturer.

502.02.05D Test Station Materials

Flush-mounted test station shall be a “Portland” cast iron valve box complete with a terminal board suited to the application.

Post-mounted test station shall be a rigid pipe design with a terminal board suited to the application. Test station shall be of molded Makrolon polycarbonate, mounted on white ultra-violet stabilized polyethylene conduit pre-drilled with anchor and access holes for wires. Conduit shall be supplied in standard 6-foot length with anchor. Hardware (machine screws, washers, hex-nuts) shall be marine brass nickel-plated. Each test station shall consist of a lockable cover, a terminal board with integral compression fit base, a compression nut for clamping the base to

the conduit, and complete hardware. Test station shall be yellow-colored and 3-inch diameter conduit size unless otherwise indicated on the plans, with a 5-lead or 8-lead terminal board as required. Test station shall be Big Fink by Cott Manufacturing Company or approved equal.

502.02.05E WIRE

Wire for test stations and galvanic anodes shall be single-conductor, stranded copper with 600-volt type TW or THWN insulation. Wire for joint bonds shall be single-conductor, stranded copper with 600-volt type HMWPE insulation. Provide the wire size shown on the plans, Standard Details, or as specified by the Engineer.

502.02.05F REFERENCE ELECTRODES

Reference electrodes shall be 1.4-inches by 1.4-inches by 9-inches long, cast of special high-grade zinc as specified in ASTM B6. Reference electrodes shall be supplied prepackaged in a permeable cloth bag with 75% gypsum, 20% bentonite, and 5% sodium sulfate backfill. Lead wire shall be unspliced and sized by the manufacturer for the specific site, but a minimum of 25-feet long of No. 12 AWG stranded copper wire with yellow 600-volt Type THWN insulation shall be used. The lead wire shall be attached to the electrode core with the manufacturer's standard connection. The connection shall be stronger than the wire.

502.02.05G GALVANIC ANODES

Supply galvanic anodes of the quantity, composition, dimensions, metal weight, and packaged backfill specified by the Engineer of Record and approved by the Engineer. The anodes shall be prepackaged in a permeable cloth bag containing the manufacturer's prescribed backfill and the packaged anode shall be a minimum of 2.5-times the bare anode weight. The anode lead wire shall be connected by the manufacturer and it shall be of an unspliced length specific to the application but not less than 10-feet.

502.02.05H CONDUIT

Rigid PVC conduit shall be Schedule 40 UL listed for direct burial, concrete encasement and exposed. Approved manufacturers are Carlon, US Plastics, or approved equal. Openings into conduit shall be smooth and rounded to prevent damage to wire insulation. Changes in direction shall be made with manufactured 2-foot-radius minimum sweeps.

502.02.05I WIRE SPLICE KITS

A. Wire connectors shall be compression type suitably sized for wire size.

B. For wire splices the connectors shall be butt style HyLink Type YSV or approved equal.

C. For test lead-ends the connectors shall be HyLug Type YAV or approved equal.

Where Engineer orders wires to be spliced and extended, the following materials, or approved equal, shall be used: for #8 AWG wire, splice with Burndy No. KS20 split bolt connector and 3M Scotchcast resin-splicing kit No. 90-B1; for #12 AWG wire, splice with 3M DBY Direct Bury Splice Kit.

502.02.06 CAST IRON VALVE BOXES

Valve boxes shall be the cast iron "Vancouver" pattern (18-inches tall casting only) or "Portland" pattern. Valve riser pipe from the valve to the cast iron top shall be 6-inch PVC pipe ASTM D3034, SDR35 for the "Vancouver" box, or 8-inch PVC pipe ASTM D3034, SDR35 for the "Portland" box. See **Standard Detail 511, "Vancouver" Style Valve Box and Standard Detail 512, "Portland" Style Valve Box**. "Vancouver" pattern valve boxes shall be used for all valves and 2-inch

blow-off standpipes. “Portland” pattern shall only be used for 4-inch and 6-inch blow-off standpipes and for cathodic protection test stations.

Valve box castings shall be smooth and uniform. Box lid shall not protrude above the rim and lids shall seat flat without rocking. Boxes of uneven thickness, pitted, or otherwise flawed in the casting will be rejected. PVC pipe shall be cut off smooth with no sharp edges and shall be one continuous piece from valve to valve box assembly.

502.02.07 METER BOXES AND COVER

Meter boxes for 1” service lines shall be Brooks #37, or approved equal, without pipe holes and with a concrete meter box cover, Brooks part #70CV028RR or approved equal, as shown in **Standard Detail 515A, 3/4” – 1” Meter Cover.** Where the meter box cover is located within a traffic area, including driveways, aprons and all locations adjacent to streets with mountable curb, a 20K rated, cast iron cover, Brooks part #CI51009T&RO or approved equal, shall be supplied at no additional cost to the City.

Meter boxes for 2” service lines shall be Brooks #65, or approved equal, without pipe holes and with a concrete meter box cover, Brooks part #70CV033 with insert #CI51023RR or approved equal, as shown in **Standard Detail 515B, 1 1/2” – 2” Meter Cover.** Where the meter box cover is located within a traffic area, including driveways and aprons, a 20K rated and steel cover, Brooks #65 TFR steel cover (flush) or approved equal, shall be supplied at no additional cost to the City.

502.02.08 2-INCH SERVICE SADDLES

Service saddles shall be 2-inch F.I.P.T., double strap. Service saddles shall be by Romac Industries or approved equal. Body of saddle and nuts shall be ductile iron ASTM A536 Grade 05-45-12, and straps shall be stainless steel 202NS ASTM A194.

502.03 CONSTRUCTION

502.03.01 PLACING FIRE HYDRANT ASSEMBLIES

The fire hydrant assembly shall consist of a hydrant, gate valve, valve box, accessories, concrete block, drain rock, and retainer glands.

The fire hydrant shall be placed in a vertical plumb position on a precast 6-inch-thick concrete “pier-block” having a bearing surface of not less than 1.75 square feet. The hydrant shall be securely mechanically restrained in accordance with **Subsection 501.02.02B**. A minimum of 10-feet of mainline each side of hydrant tee and all pipe and fittings between tee valve and hydrant shoe shall be restrained. No pipe joints shall exist between auxiliary valve and fire hydrant, unless the distance is greater than 18-feet. If distance from valve to fire hydrant is greater than 18-feet, a “field-lok” type gasket or approved equal shall be used in the bell joint. Hydrant drain holes shall not be blocked. Not less than 4 cubic feet of clean 1 1/2-inch to 3/4-inch round drain rock shall be placed around the base of the hydrant for drainage. Drain rock shall be placed a minimum of 6-inches above the drain outlets. Geotextile fabric meeting the requirements of **Subsection 205.02.11** shall be placed around the drain rock. When directed by the Inspector, the fire hydrant shall be spray painted upon completion of installation. Where no sidewalk exists around hydrant bury, a 6-foot x 6-foot x 6-inch concrete pad shall be placed around hydrant. Place any adjacent sidewalk at the time the hydrant pad is poured. If the 6-foot x 6-foot pad extends into the adjacent sidewalk, the sidewalk shall be 6-inches thick through back of walk. Where the hydrant barrel is encased in concrete, polyethylene wrap shall be in accordance with **Subsection 502.02.01**. See **Standard Detail 501A, Fire Hydrant Assembly**. All above ground utilities, mailboxes, posts, etc. shall be a minimum distance of 5-feet from the hydrant in accordance with **Standard Detail 501C, Fire Hydrant Clear Zone**.

Bury line of fire hydrant shall not be below finished grade. Bury line of hydrant shall be a maximum of 2-inches above finished grade. Pumper port of fire hydrant shall be perpendicular to curb or shoulder, as applicable.

All fire hydrants shall be arranged with a maximum of a 6-foot bury, measured from the bury line to the bottom of the connecting pipe. Where the depth of the water main serving the fire hydrant is deeper than would allow a 6-foot bury to be installed, restrained vertical bends shall be used in the 6-inch fire hydrant lead pipe to allow for a 6-foot or less bury. See **Subsection 5.04.03**.

Fire hydrant extension kits are not allowed, unless authorized by the Engineer. A representative of City Water Operations personnel shall be present at any extension kit installation procedure.

Guard posts, a minimum of 3.5-feet high, shall be required for protection from vehicles when necessary. Such protection shall consist of 4-inch diameter steel pipes 6-feet long, filled with concrete, and buried a minimum of 3-feet deep in concrete, and located at the corners of a 6-foot square with the hydrant located in the center. Posts shall be painted with the same paint as the fire hydrant.

One blue reflective marker shall be installed adjacent to the hydrant location per **Standard Detail 501B, Typical Hydrant Marker Location**.

502.03.02 Placing Permanent Blow-Off Assemblies

The blow-off assembly shall be placed as shown in **Standard Detail 506A, 2" Blowoff Assembly or Standard Detail 506B, 4" or 6" Blowoff Assembly** and securely blocked with concrete or mechanically restrained as required.

The mainline pipe shall be mechanically restrained in accordance with **Subsection 5.01**. If a straddle block is required, it shall be installed in accordance with **Standard Detail 509, Straddle Block**. Blow off pipe and fittings shall remain fully accessible for repair and replacement without disturbing the permanent water line.

502.03.03 Placing Combination Air Valve Units

A combination air valve unit shall consist of all items as described in **Subsection 502.02.03** and as noted on **Standard Details 505(A-B), Combination Air Valve Unit and Notes**.

The combination air valve unit shall be placed as shown on the plans, secure in place with concrete block, and all crushed gravel compacted as specified. Placing the combination air valve unit shall consist of transporting, assembling, and placing of the complete unit, tapping the water main, excavating and backfilling as specified, servicing, and all surface restoration.

502.03.04 Corrosion Control Installation

502.03.04A Exothermic Welding And Underground Electrical Connections

Exothermic Weld: The electrical connection of copper wire to steel, ductile iron, and cast iron surfaces shall be by the thermite weld method. Before the connection is made, the surface shall be cleaned to bare metal by making a 2-inch x 2-inch window in the coating, and then filing or grinding the surface to produce a bright metal finish. After the weld connection is made, it shall be covered with a Tapecoat Gray Pad or approved equal. Any damage to the pipe coating or lining shall be repaired according to the coating manufacturer's recommendations.

502.03.04B TEST STATION INSTALLATION

On all metallic and metallic-reinforced pipelines that are specified to be joint-bonded or are otherwise electrically continuous, install test stations of the type indicated and locate as shown on the plans and as specified herein. Where possible, locate test stations near existing structures such as telephone and power poles or fire hydrants with appropriate separation as necessary.

Unless specified otherwise by the Engineer, locate test stations as follows:

A. General – Install typical test stations as appropriate to maintain 1,000-foot maximum intervals.

B. Foreign – Where the City's pipeline crosses at any clearance, a foreign-owned pipeline that is cathodically protected or is 12-inches or larger in diameter.

C. Insulating Connection – At all buried connections between bonded and unbonded pipe, except insulated service connections where the service line diameter is 2-inches or less.

D. Cased Crossing – At all cased crossings. For casings 50-feet long or less, install one test station. For casings over 50-feet long, install one test station at each end of the casing.

Test station wire shall be color-coded as specified or shown on the plans. Wire can be color-coded with colored plastic electrical tape. Wrap tape around wire with a 50% overlap over the last 6-inches of the wire before the terminal connector. Test station wires shall be encased in rigid PVC conduit from the pipeline to the test station box.

502.03.04C INSTALLATION OF REFERENCE ELECTRODE CELLS

Use water in the installation of reference electrode cell according to the electrode manufacturer's instructions, unless specified otherwise. Install reference electrode at the depth of the centerline of the water main and 6-inches away from the outside of the pipe. Do not install the electrode cell within 3-feet of a neighboring metallic structure. Compact the backfill around reference cells to 90% of maximum density as determined by ASTM D1557.

502.03.04D GALVANIC ANODE INSTALLATION

Unless specified otherwise, anodes shall be installed 1-foot below the pipe invert and 5-feet perpendicular to the edge of the pipe or alternately 5-feet below the pipe invert and up to 3-feet perpendicular from the pipe edge. Do not place the anodes within 3-feet of a neighboring metallic structure. When anodes are distributed along the pipeline, alternate the perpendicular offset from one side of the pipe to the other. Install the anode in clean, native backfill and not in the select bedding material. Compact the soil to 90% of maximum density as determined by ASTM D1557.

502.03.04E WIRING

All wiring is to be splice-free, except where splices are specified or shown in the plans. All underground connections must be pre-approved in writing by the Engineer. Coil and snake buried wire in a slack fashion to prevent stress from backfill operations and earth settlement. All wire is to be buried a minimum of 30-inches below finish grade and installed in rigid conduit. All wire connections to test station terminal boards are to be made with crimp-on ring terminals. Repair any damage to the wire insulation with 2-layers of self-adhering ethylene rubber electrical tape Scotch No. 130C, or approved equal, and over-wrap with 2-layers of vinyl

electrical tape Scotch No. 88 or approved equal. Spirally apply each layer at 50% overlap. This repair method is not applicable to repair of anode wire for impressed current systems.

502.03.04F CONTINUITY TESTING

When specified, perform electrical continuity testing and record test data as specified by the Engineer. Repair any joint not passing the electrical continuity test at no cost to the City.

502.03.04G FOREIGN PIPELINE COORDINATION

Coordinate indicated welds to foreign pipelines with proper authorities governing the pipeline. Contractor is responsible for obtaining necessary approvals and coordination.

Where crossing a cathodically protected utility, a geomembrane or PVC casing may be required around water line.

502.03.04H POLYETHYLENE ENCASEMENT

When specified, install polyethylene encasement on all pipe and appurtenances per **Subsection 501.03.02**.

502.03.05 BACKFLOW PREVENTION ASSEMBLIES

Backflow requirements are governed by the Oregon Health Authority and Oregon Plumbing Specialty Code, as adopted by *OAR Chapter 918*, as amended or revised by the State of Oregon and except as modified by *Gresham Revised Code*. Variances from the ***Public Works Standards*** shall be consistent with the Oregon Health Authority and Oregon Plumbing Specialty Code. Any deviations must have prior written approval of the Engineer prior to installation.

502.03.05A DOUBLE CHECK VALVE AND DOUBLE CHECK VALVE DETECTOR ASSEMBLIES

Unless approved by the Engineer, as noted below, the following requirements shall apply to the installation of double check valve and double check valve detector assemblies:

A. No part of the backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. If installed in a vault or chamber, adequate drainage shall be provided onto owner's property by either drainage to daylight or by sump pump to daylight. Water tight plugs, made of similar metals, shall be installed on the test cocks.

B. The assembly must be protected from freezing and other severe weather conditions.

C. Only assemblies approved for vertical installation may be installed vertically.

D. The assembly shall be readily accessible with adequate room for maintenance and testing.

(1) Assemblies 2 inches and smaller shall have at least a 12-inch clearance below and on both sides of the assembly; and if located in a vault, the top of the assembly shall be between 18 and 24 inches below grade. See **Standard Detail 514A, Double Check Valve or Double Check Valve Detector Assembly Plan View and Standard Detail 514B, Double Check Valve or Double Check Valve Detector Assembly Elevation View**.

(2) All assemblies larger than 2 inches shall have a 12-inch clearance on the backside, a 24-inch clearance on the test-cock side, and 12-inch clearance below the assembly. Adequate clearance (3 inches minimum) must be

maintained above the outside stem and yolk (OS&Y) gate valve stem. Headroom of 6 feet is required in vaults.

E. An OR/OSHA approved chamber ladder that extends 3 feet above the surface of vaults shall be installed.

F. No post indicating valves are allowed to be installed directly on double check valve detector assemblies.

G. Only approved double check valve detector assemblies are to be used for system containment on fire line services in the City. The meter on the bypass assembly shall read in cubic feet.

H. If a fire line or tamper switch is installed, it must be connected to a monitored fire detection system approved by the Fire Marshall. Installation shall not modify the backflow assembly or interfere with its operation or maintenance.

I. All backflow assemblies shall be installed at the service connection to the premises per *OAR 333-061-0070, Cross Connection Control Requirements*.

J. All pipe between main and assembly shall be restrained. See **Section 501** for restraint specifications. Uni-flange adaptors may be used in vaults.

K. Approved backflow assembly may not be modified in any way from which it was manufactured, tested and approved.

L. Assembly flow line shall not be greater than 5 feet above ground without a permanent platform, meeting OSHA requirements, to provide for testing and maintenance.

502.03.05B REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLIES

The following requirements shall apply to the installation of reduced pressure (RP) Principle backflow prevention assemblies:

A. RPs must be sized to provide an adequate supply of water and pressure for the premises being served. Flow characteristics are not standards. Consult the manufacturer's specifications for specific performance data.

B. Premises where interruption of water supply is critical should be provided with two assemblies installed in parallel. They should be sized in such a manner that either assembly will provide the minimum water requirements while the two together will provide the maximum flow required.

C. Bypass lines are prohibited. Pipe fittings which could be used for connection of a bypass line shall not be installed.

D. The assembly shall be readily accessible for testing and maintenance and shall be located in an area where water damage to building or furnishing would not occur from relief valve discharge. An approved air gap funnel assembly may be used to direct minor discharges away from the assembly; this assembly will not control flow in a continuous relief situation. Drain lines to accommodate full relief valve discharge flow shall be required.

E. RPs shall be installed above grade in well drained areas but may be installed below grade if an adequate drain by gravity through a "boresight" drain to daylight is provided and with approval from the Engineer before installation.

F. Enclosures shall be designed for ready access and sized to allow for the minimum clearances established below. Removable protective enclosures are typically installed on the smaller assemblies. Bore sighted daylight drain ports must be provided to accommodate full pressure discharge from the assembly.

G. All assemblies larger than 2 inches shall have a minimum 12-inch clearance on the backside, a 24-inch clearance on the test-cock side, and relief valve opening shall be at least 12-inches plus nominal size of assembly above the floor or highest possible water level whichever is higher. Headroom of 6 feet is required in vaults. A minimum access opening of 36-inches x 72-inches is required on all vault lids.

H. A chamber ladder, meeting OSHA requirements, shall be permanently installed in the vault, unless a side entry enclosure is used.

I. Assemblies installed more than 5 feet above floor level must have a permanent OSHA approved platform for use by testing or maintenance personnel.

J. The assembly must be protected from freezing and other severe weather conditions.

K. RP assemblies must only be installed horizontally, vertical installation is not permitted.

L. The property owner assumes all responsibility for leaks and damage.

502.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE FOR PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

502.04.01 FIRE HYDRANT ASSEMBLY

Bid item shall include furnishing and installing hydrant, gate valve, mechanical restraint, valve box, and painting as shown on **Standard Detail 501A, Fire Hydrant Assembly** and described in **Subsection 502.03.01**. 6-inch ductile iron and tee for fire hydrant shall be paid for separately.

502.04.02 BLOW-OFF ASSEMBLIES

Payment for the blow-off assembly shall include furnishing, transporting, assembling, and placing of the complete assembly as shown on **Standard Details 506(A-B), Blowoff Assembly,** plus backfill and compaction. Main line straddle blocking shall be paid under separate bid item. Mechanical restraints shall be absorbed into the cost of the blow-off assembly and water line bid items.

502.04.03 COMBINATION AIR VALVE UNIT

Payment shall be on a per-each basis and shall include, but not be limited to, a 2-inch double-strap service saddle, 2-inch brass ¼-bend adapter, 2-inch rigid copper tubing, 2-inch combination air valve unit, meter box and lid and any other appropriate fittings needed for plumbing the valve as described in **Subsection 502.02.03**, or as noted on the **Standard Detail 505(A-B), Combination Air Valve Unit and Notes**. Payment shall also include excavation and backfill, but pavement and sidewalk cut and repair each shall be paid for separately as described in the Contract Documents. All materials used shall be of the type as designated in **Subsection 502.02.03** and **Standard Detail 505(A-B), Combination Air Valve Unit and Notes**.

502.04.04 Water Quality Sampling Station

Payment for sampling station shall be on a per-each basis and shall include furnishing and installing all materials, complete-in-place, as shown on **Standard Detail 504, Water Sampling Station**, including but not limited to excavation, backfill, groundwater control, testing, and other incidental work items. When not listed in the Schedule of Prices, sidewalk cut and repair shall be considered incidental work for which no separate payment will be made.

502.04.05 Corrosion Control

Any items under this section that are specifically shown as bid items in the Schedule of Prices will be bid and paid accordingly. All items under this section that are not specifically shown as separate items in the Schedule of Prices must be included in the price bid for the pipeline and no additional payment will be made for them. The bid prices, whether covered as separate items or as part of the pipeline price, include all costs for labor and materials required for a complete installation as shown on the plans, Standard Details, and as described in the Contract Documents.

Payment for bonded and poly-wrapped pipe shall include all materials and labor for joint bonding, exothermic welding, continuity testing, polyethylene encasement, and any other corrosion control measures shown on the plans or described in the Contract Documents, in addition to the work described in **Subsection 501.04.01, Installation of Pipe**.

Payment for test stations shall be made on a per-each basis under the bid item “Install Test Station”, and shall include all labor and materials to install test station wires, thermo-welding, rigid PVC conduit, test station box, terminal board, excavation and backfill, groundwater control, landscape restoration, continuity testing, and other incidentals.

Payment for providing and installing dielectric insulating connection between bonded and unbonded pipe shall be absorbed into the bid item, “Cut-In and Connect to Existing Main.”

503 Work on Water Systems

503.01 Description

This section covers, but is not limited to, the work necessary for removing and/or abandoning existing water works materials, testing requirements and connecting to existing mains. All work in this section shall be in accordance with the requirements of **Sections 501 and 502** unless otherwise modified herein.

503.02 Construction

503.02.01 Storage Of Equipment And Materials

Unless otherwise noted on the plans or in the Contract Documents, it shall be the responsibility of the Contractor to locate an approved storage site for all equipment and materials.

Prior approval shall be obtained from the governing agency for any storage of equipment or materials within the right-of-way (e.g., stringing of pipe).

Pipes, fittings, and valves shall be stored in such a way as to minimize contamination or damage prior to installation.

503.02.02 Water Line Tapping

When specified, a tap on existing water line shall be made to minimize interruption of service to customers. When taps are done by non-City Water Operations personnel, only qualified

and City approved tapping companies shall be permitted to tap City water lines. Tapping sleeve and valve shall conform to **Subsection 501.02.10**.

Before attaching tapping sleeve, care shall be taken to clean water main of all debris and defects. Attach sleeve and valve to the main. Then attach proper tapping machine to valve. Pressure test this assembly before making tap. After making tap, remove the tapping machine and inspect fitting and valve for leaks. If any such leaks are found, Contractor shall be required to repair the defect. Attach branch to valve and install pipe in accordance with **Subsection 501.03.01.** Taps shall be made no closer than 18-inches from end of sleeve to nearest joint, tap, or fitting. Maximum allowable tap shall be 10-inches, unless authorized by the Engineer.

Thrust blocks are required for any tap greater than a 2-inch. Excavation for tap shall be such as to fully expose main with a minimum depth below main of 12-inches. A minimum of 18-inches of main shall be exposed from the end of the tapping sleeve. Also, excavate enough area to accommodate tapping machine, workers and thrust block.

503.02.03 Removing Existing Water Works Materials

When the Contractor removes existing pipe, gate valve units, fittings, fire hydrant units or other items to allow installation of the work specified herein, Contractor shall haul the removed water works materials to the City's designated storage yard unless otherwise directed by the Engineer. Title to the removed materials shall remain with the City unless otherwise designated by the Engineer. If directed, Contractor shall be responsible for disposal of materials.

503.02.04 Abandoning Existing Mains And Valves

Any existing water lines less than 3-inches in diameter that are abandoned shall be severed and plugged with non-shrink grout, or as directed in the field by the Inspector. Any existing water lines 3-inches in diameter or greater that are abandoned shall be severed and plugged with an appropriately sized mechanical joint cap.

Any valves associated exclusively with abandoned water lines shall be abandoned by removing the valve box and cutting off the riser 12-inches below grade. The hole shall be gravel filled and asphalt plugged. Valve abandonment shall be considered incidental work to any water line abandonment no separate payment will be made.

503.02.05 Maintaining Service

The Contractor shall schedule construction work specified herein to maintain continuous water service to existing water users. Where it is necessary to shutdown service to make required inter-ties, the Contractor shall coordinate with the Public Works Inspector at least 2-working-days prior to a planned water service shutdown to allow the City staff to notify users of the impending interruption of water service. More notice may be required by the Engineer.

The Inspector shall notify Water Operations. If a fire hydrant will be affected by the shutdown, Water Operations will notify the Fire and Emergency Services Department. The Contractor may be required to make necessary service shutdowns of affected businesses after regular business hours at no additional cost to the City.

503.02.06 Flushing

The new pipeline, which includes all fittings, valves, services, and fire hydrants, shall be flushed, pressure tested, and disinfected, in this order, before any connection to the existing water system is made. Blow offs shall be provided by Contractor at all dead ends and points of connection to the existing system as shown on **Standard Details 506(A-B), Blowoff Assembly**. A temporary fill point shall be provided by the Contractor as shown on **Standard Detail 506C, 4" or 6" Temporary**

Fill Point for filling, flushing, pressure testing, and chlorinating the new water system. The new water line shall be built as close as possible, as determined by the Inspector, to the existing water system at points where connections are to be made. Blow-offs shall be located at high elevation points and fill points shall be located at low elevation points where practical.

Prior to any flushing procedures taking place, the Contractor may be required to submit a flushing plan providing direction of flow, water damage control, and a written schedule to the Engineer for approval. A minimum 48-hour notice shall be given to the Inspector prior to any system shutdown or flushing procedures. Under no circumstance shall the Contractor operate any City valves without prior explicit approval by the Engineer.

The following chart shows minimum temporary blow off/inlet sizes that shall be provided by the Contractor. Gate valves shall be provided on blow off and inlet pipes to pressure test against, and to keep the pipe interior clean when backflow assembly is removed. See **Standard Details 506(A-C)**.

Table 503.02.06 REQUIRED OPENINGS TO FLUSH PIPELINES

NOMINAL PIPE SIZE (inches)	FLOW REQUIRED TO PRODUCE 3.0 FPS VELOCITY (GPM)	MINIMUM INLET & OUTLET PIPE SIZE REQUIRED (inches)
4	120	2
6	260	2
8	470	4
10	730	4
12	1,060	4
14	1,440	6
16	1,880	6
18	2,380	6
20	2,940	6
24	4,230	6

Flushing shall be done at a velocity of 3.0 FPS or greater for a length of time necessary to fully exchange the water in the system two times or until the flushed water is visibly clean, whichever is greater. If the static pressure in the City's existing system is insufficient to create a flushing velocity of 3.0 FPS or greater, the system shall be flushed at the maximum velocity possible for a length of time necessary to fully exchange the water in the system three times or until the water is visibly clean, whichever is greater.

Contractor is required to de-chlorinate all water flushed onto the street surface or into any stormwater drainage system. Dechlorination process shall be approved by Engineer of Record prior to flushing.

All flushing and testing water shall be delivered to the new water line through a double check valve assembly.

The City can provide a 2-inch or 6-inch double check valve assembly, or Contractor may provide an assembly. Certified backflow tester shall test assembly and furnish documentation to the Inspector indicating a passing test after assembly is installed onsite and before it may be used.

Contractor shall coordinate with the Inspector at least 5-working-days in advance of when the backflow assembly will be needed onsite.

All water used during flushing, pressure testing, and chlorinating shall be metered and billed to Contractor. Metering device shall be installed by the City Water Operations personnel at the same time and location as the double check valve assembly.

503.02.07 PRESSURE TESTING

Pressure testing must be performed on all new pipe after flushing and before chlorination.

After being installed, all pipes, fittings, services, fire hydrants, and all individual closed valves, except the last connection with the existing main, must be pressure tested, conforming to AWWA C600 Section 5 Specifications except as noted. The pipeline may be divided into sections and tested in stages at the option of the Contractor. If the Contractor elects to test the line in sections, the lengths of the sections and provisions for testing shall be subject to approval by the Engineer. Test pressure shall not exceed 150% of pipe pressure rating in any section.

Before testing the pipeline for leakage, the pipeline shall be properly restrained.

The Contractor shall furnish necessary thrust blocks, pumps, medium range pressure gauges, means of measuring water loss, and all other equipment, materials, and labor required for making the tests. Pressure gauges shall be graduated to a minimum of 1psi increments.

All air vents shall be open during the filling of the pipeline with water. After a test section is completely flushed and filled, it shall be allowed, at the Contractor's option, to stand under slight pressure for 24-hours to allow the lining to absorb what water it will and to allow the escape of air from any small air pockets. During this period, the bulkheads, valves, and exposed connections shall be examined for leaks. If any leaks are found, they shall be repaired. The pressure shall then be raised slowly to the hydrostatic pressure of 150 pounds per square inch, or 1.5 times the normal working pressure, whichever is higher, measured at the point of highest elevation. The test pressure shall be maintained for a period of at least 1-hour, beginning at a time of day to be mutually agreed upon between the Contractor and the Inspector.

The acceptable leakage allowance shall be ½ of AWWA C600 Section 5 Specifications. While the pipe is under pressure and regardless of whether or not the measured leakage is within allowable limits as set forth, an inspection for leaks along the pipeline shall be made by the Contractor. Any leaks found shall be recorded and shall be repaired by the Contractor. All such repairs shall be made subject to the approval of the Engineer and in the presence of the Inspector.

The Contractor, at no expense to City, shall perform any excavation required to locate and repair leaks or other defects that may develop under the test. The Contractor shall remove backfill and paving already placed, shall replace such removed material, and shall make all repairs necessary to achieve the required water-tightness.

If any considerable leakage has been discovered or if the measured leakage exceeds the limit stated, the Engineer shall require one or more re-tests after repairs have been made. All repairs and re-tests shall be made at the Contractor's sole expense.

Once the entire system or section has passed the 1-hour pressure test, the Contractor shall then proceed testing each individually closed valve within the new system. Individually closed valves shall be pressure tested for a minimum of 10-minutes using the same rate of loss criteria stated above. If any valves are found to not hold pressure, they shall be operated, repaired or replaced, and retested until they pass.

If at any point leakage requires the system to be opened to atmosphere, the system shall be flushed and pressure tested again.

All leakage tests shall be made in the presence of the Contractor and the Inspector.

503.02.08 CHLORINATION

After flushing and pressure testing, all new pipe must be chlorinated in accordance with this section.

The Contractor shall furnish and place all necessary fittings required for the testing, chlorinating, and flushing of the pipeline. See **Standard Detail 506C, 4" or 6" Temporary Fill Point**. At the contractor's option, a valve may be added between the main and fill point.

The pipeline fittings and valves shall be thoroughly chlorinated and flushed in accordance with Oregon Administrative Rule 333-061 and AWWA C651 through C654. Chlorine in the form of calcium hypochlorite or sodium hypochlorite containing approval from the National Sanitation Foundation (NSF) shall be applied at the beginning of the section adjacent to the feeder connection and shall be injected through the temporary fill point per **Standard Detail 506C** to ensure treatment of the entire line. Water with chlorine shall be fed slowly into new line to produce a free chlorine residual greater than 25-mg/l but not more than 50-mg/l throughout the system. Filling shall ensure the wetting of all surfaces and the discharge of all trapped air. The solution shall remain in place for 24 hours. After the 24-hour period, the free chlorine residual shall be checked. If the measurement is found to be 10-mg/l or more, the chlorine solution shall be flushed from the facility with potable water. If a free chlorine residual of less than 10-mg/l is indicated, the facilities shall be flushed and re-chlorinated by the Contractor at no cost to the City, and rechecked until a final residual of 10-mg/l or more is achieved after a 24-hour standing time.

After the final residual is confirmed at 10-mg/l or more and the facility is flushed and filled with potable water, bacteriological samples shall be taken to determine the procedure's effectiveness. A sample must be collected a minimum of every 1000 feet and at each dead end, branch, and point of input. Sample points may be required to be removed upon completion of testing. No hose or fire hydrant shall be used to collect samples. A minimum of two samples must be collected at least 16 hours apart for microbiological analysis. If the pipe has held potable water for at least 16 hours before sample collection, two samples may be collected at least 15 minutes apart while the sample tap is left running. If the results of both analyses indicate the water is free of coliform organisms, the facility may be put into service. If the microbiological analysis indicates the presence of coliform organisms, flushing and disinfection must be repeated by the Contractor at no cost to the City until a sample free of coliform organisms is obtained.

During the chlorination process, all valves, fire hydrants, and services shall be operated. All parts of the line and services shall be chlorinated. After chlorination, the water shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. At no time can chlorinated water be discharged to the stormwater drainage system or a waterway. All chlorinated water shall be discharged into the public sanitary sewer system. If a sanitary sewer is not available, the Contractor shall employ the use of storage tanks, basins, or other means to transport or treat the chlorinated water for discharge to an approved point of disposal.

503.02.09 CUT-IN AND CONNECTION TO EXISTING MAINS

After a new water line is flushed, pressure tested, and disinfected, but prior to any cut-in and connections, Contractor shall hold an onsite pre-connection meeting. Those to attend shall include the onsite foreman, the Public Works Inspector, City Water Operations personnel, and the Engineer.

This meeting shall take place prior to each connection but not longer than one-week prior to the connection. At this meeting Contractor shall have all fittings, pipe, chlorine swabbing equipment, pumps and hoses, and all equipment needed to make the cut-in and connection. Cut-in schedule and coordination shall be discussed.

Once the bacteria test has been passed, cut-ins and connections to the existing water system shall be made within one week or as approved by the Engineer. All fittings necessary for the cut-in and pumps adequate to handle water in the trench shall be on hand and ready for service before connection is commenced. If the new water line is opened to the air before Contractor and City Water Operations personnel are ready to proceed with the connection, or if new water line is contaminated by dirt or dirty water, the new water line shall be flushed, disinfected, and microbiologically re-tested. All work associated with cut-in and connections shall be done in the presence of the Inspector.

Fittings and pipe for cut-ins shall be cleaned and swabbed-out thoroughly with a 1% chlorine solution (one-half pound of 64% calcium hypochlorite in 4-gallons of water). Swabbing equipment shall be new and solution shall be kept clean and fresh.

During each connection, work shall proceed until the connection is completed and water service is turned back on. Groundwater shall not be allowed around any of the existing piping during the connection.

Where connections are made between new ductile iron water line and a water line of similar outside diameter, a long-pattern, mechanical-joint sleeve shall be used. Where connections are made between new ductile iron water line and a water line of the same nominal diameter but a different outside diameter, a transition coupling as manufactured by Dresser, or approved equal shall be used.

After the connection is completed and water service is turned back on, Contractor shall dry all fittings. A visual leak inspection of all fittings shall be done by the Inspector prior to backfilling. Visual inspection shall be done in such a manner that any amount of leakage may be detected.

503.02.10 Impervious Dams

In areas where a water line is installed outside of paved surfaces and indicated on the plans or as directed by the Inspector, the Contractor shall place impervious dams to prevent groundwater movement along the trench. Dams shall be made of impervious backfill material composed of particles at least 50% of which pass a No. 200 sieve and with a plasticity index not less than 20, unless otherwise approved by the Engineer.

In areas where a water line is installed under existing or future paved surfaces and indicated on the plans or as directed by the Inspector, the Contractor shall place controlled low-strength material (CLSM) dams to prevent groundwater movement along the trench. CLSM shall meet specifications as outlined **Subsection 206.02.05B**.

A dam shall fill the trench completely from side to side and top to bottom, except for the volume occupied by the pipeline and any materials required for surface restoration. Pipe in contact with clay or CLSM dam shall be wrapped with two layers of 8-mil polyethylene.

503.03 Measurement and Payment *(Not applicable for privately financed public improvements)*

503.03.01 Cut-In And Connection To Existing Main

Connections that require cutting into existing lines shall be paid for as bid in the Schedule of Prices for cut and connect to existing main. Existing line sizes shall be field-verified by the Contractor before ordering fittings and undertaking the work involved in this item. Payment for the connections shall include removal of existing pipe, fittings, thrust blocking, and furnishing and installing all adapters, solid sleeves, spools, and excavation and clearing and grubbing necessary to

make the connection. Valves, bends, tees, or crosses required for such connections shall be paid for separately as listed in the Schedule of Prices for valves and fittings respectively.

503.03.02 Water Line Tapping

Connections that require wet tapping of existing mains shall be paid for as bid in the Schedule of Prices for wet tapping of existing main. Existing line sizes shall be field-verified by Contractor before ordering materials and undertaking work involved in this item. Payment for this item shall include providing tapping tee, resilient wedge gate valve, tapping of main, any extra adapters, sleeves, and spools, thrust blocks, and all excavation required to make tap and connect new water line.

503.03.03 Abandoning Existing Main And Valves

Payment for water main abandonments shall be paid on a per each basis and shall include labor and materials as specified in **Subsection 503.02.04**.

503.03.04 Over-Excavation

Over-excavation shall be paid by the cubic-yard based on the volume of the trench excavated. The quantity measured for payment of over-excavation shall begin once the extra depth reaches 18-inches below the designed grade and payment shall be only for the material lower than 18-inches below design grade.

Payment for over-excavation shall include excavating the trench, disposing of material removed, placing and compacting select backfill material, shoring, and other requirements for working at a greater depth. Provision for select backfill, for over-excavated areas, shall be paid for by the linear foot as provided in the Contract Documents.

503.03.05 Other Items

Unless otherwise specified on the plans or in the Contract Documents, valve units, fire hydrant units, blow off units, air release valve units, connections to existing mains, and services shall be paid on a per-each unit basis for furnishing and installation of the unit complete-in-place, tested, and ready for service.

Items that are specifically listed in the Schedule of Prices will be bid and paid accordingly. All items that are not specifically shown as separate items in the Schedule of Prices must be included in the price bid for the pipeline, and no additional payment will be made for them. The bid prices, whether covered as separate items or as part of the pipeline price, include all costs for labor and materials required for a complete installation as shown on the plans and described in the Contract Documents.

End of Chapter

CHAPTER 600 - TRANSPORTATION TECHNICAL REQUIREMENTS

601 SUBGRADE

601.01 DESCRIPTION

This section covers work necessary for preparation of the subgrade, complete. See also **Section 204** and **Section 206**.

Subgrade is defined as the area of new or existing roads, streets, alleys, driveways, sidewalks, or other locations upon which additional materials are to be placed as a part of work or by future work. Where applicable, subgrade may be considered to extend over the full width of the specified base course.

601.01.01 UNTREATED SUBGRADE

The material placed in fills or unmoved from cuts in the normal grading of the roadbed, and that is brought to true line and grade, shaped and compacted, as required by these specifications to provide a foundation for the pavement structure.

601.02 MATERIALS

601.02.01 WATER

Conform to the requirements in **Subsection 205.02.03**.

601.03 CONSTRUCTION

601.03.01 PREPARATION OF SUBGRADE

Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed shall not vary more than .05-feet from the specified grade and cross section. Subgrade upon which subbase or base material is to be placed shall not vary more than .10-foot from the specified grade and cross section at any point. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

Blade and shape subgrade to meet grade and cross sections shown on plans.

Prior to starting subgrade work, including backfill, all underground work contemplated in the area of the subgrade shall be completed. This requirement includes the Contractor's work and work to be performed by the City or by others.

The Contractor shall remove all soft or otherwise unsuitable material as directed and replace with approved material. The Contractor shall compact to a line 1-foot beyond the edge of paving, curb, or form.

Subgrade areas that cannot be compacted to specified density but, in the judgment of the Engineer, otherwise meet the requirements herein, may be removed and aerated or stabilized with an approved soil stabilizing material – all at no additional expense to the City.

Subgrade materials that cannot be compacted to specified density due to excess moisture shall be dried out to bring materials to ±2% of optimum moisture. The Contractor shall aerate, drain, re-handle, amend with lime or cement, or by other means at his option remove the excess moisture. All costs involved in the removal of excess moisture from the material are the responsibility of the Contractor for which no additional payment will be made.

601.03.02 Grading of Areas Not to be Paved

When specified, areas within and adjacent to the project that are intended for lawns, planting areas, flower beds, and similar uses shall be finished with 4-inches of topsoil and graded smooth as directed. Topsoil for such finishing shall be fertile, loamy, natural-surface soil consisting of sands, silts, clays, and organic matter and shall be free of toxic substances, weeds, roots, refuse, sticks, large rocks, or lumps. Topsoil available from required excavation shall be used to the greatest extent possible in this work. The premature disposal of suitable topsoil material shall be prohibited.

601.03.03 Over-excavation and Foundation Stabilization

When, in the opinion of the Engineer, unsuitable material or other conditions are discovered that render the subgrade unable to be compacted to the specified density, then the Engineer may order the Contractor to remove and dispose of the unsuitable material and then backfill with crushed rock as specified in the applicable portions of **Section 206**. Geotextiles may be required before backfilling.

601.03.04 Embankment Construction

Embankments shall be constructed per **Subsection 206.03.14A**.

601.03.05 Slides and Slip-outs

Material outside the planned roadway or ditch slopes that, in the opinion of the Engineer, is unstable and constitutes potential slide material that may come into the roadway, channel, or ditch, and material that has slipped out of new or old embankments shall be excavated and removed. The material shall be excavated to designated lines or sloped either by benching or in such a manner as directed by the Engineer. Such material shall be used in the construction of the embankments or disposed of as directed by the Engineer.

The above provisions shall not be so construed as to relieve the Contractor of his obligation to maintain all slopes true and smooth.

601.03.06 Slopes

Excavation and embankment slopes shall be finished in conformance with the lines and grades shown on the plans.

601.03.07 Finishing and Cleanup

All roadbeds, planting areas, ditches, embankments, and other areas on which earthwork is performed shall be trimmed reasonably close to established lines, grades, and cross sections and shall be finished in a thoroughly workmanlike manner. They shall be kept free, throughout the work, of debris and foreign matter of all kinds. Prior to final acceptance the entire right-of-way shall be cleaned up and finished as directed by the Project Manager.

601.03.08 Compaction and Density Requirements

The density of compacted materials in-place will be determined by nuclear densometer or other methods as approved by the Engineer, and the maximum density will be determined by ASTM D1557.

The Contractor shall compact all embankments, fills, and backfills within 3-feet of established subgrade elevation to a minimum density in place of 95% of maximum density. Below said 3-foot limit compaction shall be a minimum density in-place of 90% of maximum density.

Roadbed cuts and foundations for structures to a depth of 1-foot below established subgrade or foundation elevation shall be 3-inch maximum material and shall be compacted to a minimum density in-place of 95% of maximum density.

601.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

601.04.01 INCIDENTAL WORK

No measurement will be made for work involved in draining water from the subgrade, grading the subgrade in preparation for staking, or blading, shaping, and compacting the subgrade, including roadbed materials to a depth of 12-inches below the subgrade, to final line, grade, and cross section. All work involved in these processes will be considered incidental to and included in the various other items of work in the Contract Documents.

Water used in the work (compaction, dust control, etc.) will be considered incidental to and included in the various other items of work in the Contract Documents.

601.04.02 UNTREATED SUBGRADE

No measurement and payment will be made for preparation of untreated subgrade unless otherwise provided.

601.04.03 OVER-EXCAVATION AND FOUNDATION STABILIZATION

Measurement and payment for over-excavation and foundation stabilization will be made on “neat line”, cubic-yard basis for quantities removed.

601.04.04 EMBANKMENT

Embankment in-place will be measured by the cubic yard of embankment as set forth below.

The pay quantities of embankment will be determined by cross-section measurement of the material in place in final embankment position in the work as specified and in accordance with the directions of the Project Manager. The pay quantities of embankment will be limited to the neat lines of specified cross-sections, lines, grades, and slopes, and above the ground or base elevations existing at the time embankment construction thereon begins. The pay quantities will not include additional quantities required due to subsidence and settlement of the ground or foundation, or to settlement of materials within the embankments, or to shrinkage, settlement, washout, slippage, or loss, regardless of cause.

There will be no measurement of overhaul on embankment materials.

Payment for embankment will comprise full compensation for the excavating, selecting, handling, hauling, placing, and compacting of the materials and all other costs incurred in the construction of the embankments involved.

602 WATERING

602.01 DESCRIPTION

This section covers work necessary to furnish and apply water for roadway excavations, fills, subgrades, roadbeds, backfill, subbases, bases, and surfacings, and water used for the alleviation or prevention of dust within the project limits.

602.02 MATERIALS

602.02.01 WATER

Conform to the requirements in **Subsection 205.02.03**.

602.03 CONSTRUCTION

The Contractor shall make all arrangements necessary for the procurement of water and its application. The Contractor shall obtain a hydrant meter from the City for the purposes of measuring all water used on the project.

Water by means of tank trucks equipped with spray bars, by hose and nozzle, or by other approved equal means that ensure uniform and controlled application. The use of splashboards will not be permitted without prior approval.

Perform watering at any hour of the day and on any day of the week as necessary. Make all necessary arrangements for obtaining water. Maintain an adequate supply of water at all times to complete the required work.

602.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE FOR PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

602.04.01 WATER

When neither specified nor shown in the Contract Documents for separate payment, all water will be considered incidental to the other items of work and no separate measurement or payment will be made.

603 AGGREGATE BASES

603.01 DESCRIPTION

This section covers work necessary to furnish and place all courses of aggregates, as base, on a prepared surface.

603.02 MATERIALS

Aggregates for aggregate base shall be crushed rock.

603.02.01 AGGREGATE

Coarse and fine aggregates shall conform to requirements of **Subsection 205.02.04** and to additional requirements contained herein.

603.02.02 SAND EQUIVALENT

Base aggregates to be incorporated in the work shall have a sand equivalent of not less than 50 when tested in conformance with AASHTO T 176.

603.02.03 LIQUID LIMIT AND PLASTICITY

Base aggregate shall meet the requirements for liquid limit and plasticity index of **Subsection 205.02.04C**.

603.02.04 Grading Requirements

The base aggregates shall be uniformly graded from coarse to fine and shall conform to requirements of **Subsection 206.02.05A** and additional requirements contained herein.

603.02.05 Acceptance

Acceptance will be based on periodic samples taken following mixing or placement.

603.03 Construction

603.03.01 Preparation of Subgrade

Ensure that all surfaces and materials on which subbase or base is to be constructed are firm and have been prepared as specified in the applicable portions of **Section 601**.

603.03.02 Mixing

Mix to provide a homogeneous mixture of un-segregated and uniformly dispersed materials that will compact as specified in **Subsection 603.03.04**.

603.03.03 Placing

603.03.03A Weather Limitations

When the weather is such that satisfactory results cannot be secured, the Contractor shall suspend operations. Place no surfacing materials in snow or on a soft, muddy, or frozen subgrade. The City will not be liable to damages or claims of any kind or description by reason of operations being suspended due to weather limitation.

603.03.03B Equipment

Furnish equipment that will provide for efficient and continuous operations insofar as practicable.

Aggregate bases shall be deposited on the roadbed at a uniform quantity per lineal foot so that the Contract will not resort to spotting, picking up, or otherwise shifting of aggregate base material. Segregation of aggregates shall be avoided and the material as spread shall be free of pockets of coarse or fine material.

Spreading equipment shall have an adjustable screed or strike-off assembly and it may have a receiving, mixing, and distribution system. It may be a complete and integral unit, self-propelled and powered; a crawler-track or wheeled type tractor intimately combined with a receiving, mixing, spreading, and screeding unit attached thereto; or a heavy-duty self-propelled grader, of an approved type, equipped with at least an 8-foot blade. Equipment shall be capable of spreading or striking off material to the designed line, grade, and transverse slope with surface texture of uniform appearance without excessive segregation or fracture of material.

Spreading equipment may be provided with an automatic control system if Contractor so elects or if specified.

603.03.03C Thickness of Lifts

If the required compacted depth of the base course exceeds 12-inches, construct in 2 or more layers of approximate equal thickness. Maximum compacted thickness of any 1-layer shall not exceed 12-inches. Place each layer in widths as wide as practicable and to full width of the course before a succeeding lift is placed.

603.03.04 Compaction

At the time compaction begins, the materials shall be at optimum moisture content ±2%. Compaction of each layer shall continue until a density of 95% of the maximum density has been obtained according to ASTM D1557. Water shall be added to the materials as necessary during the compaction to maintain the proper moisture content.

603.03.05 Surface Finish

Surface of the base shall parallel the established cross section and grade for the finished surface within 0.04-foot. The finished surface of base, when tested with a 12-foot straight edge, shall not vary from the testing edge by more than 0.04-foot at any point. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

603.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

603.04.01 Aggregate Bases

603.04.01A Square Yard Basis

Measurement and payment of aggregate base made on a square-yard basis will be made of width and length of each separately-constructed strip of aggregate base incorporated in the work and accepted wherein width is the design width or edge-to-edge width of aggregate base, whichever is the lesser, and length is from end to end along the center of the strip. Measurement shall be on the surface of the aggregate base to the nearest 0.1-foot and the square yardage shall be to the nearest full square yard.

Extra thickness of aggregate base, when directed by the Project Manager, will be measured by conversion on a proportionate volume basis to an equivalent number of square yards of specified standard thickness of base.

603.04.01B Cubic Yard In-place Basis

Measurement and payment of aggregate base made on a cubic yard, in-place basis will be limited to the quantities required to construct neat lines of cross-sections, lines, grades, and slopes as depicted in the project plans. Measurement and payment will not include additional quantities used for the contractor's convenience or careless placement.

603.04.01C Ton Basis

Measurement and payment made on a ton basis will be for the number of tons of aggregate base as weighed on approved and tested scales. Give scale tickets to the City as the material is delivered. Each ticket shall show the date and time of delivery, truck number, driver's name, and net weight of material and will be considered as valid delivery receipts only when so provided. Deductions in weight will be made at the point of weighing for moisture in excess of the optimum moisture content determined for the material being supplied.

604 Cement-Treated Base

604.01 Description

This section covers the work necessary for the furnishing and construction of cement treated base (CTB) complete-in-place.

604.02 MATERIALS

Composition of Mixture

The CTB mixture shall be comprised of aggregate, Portland Cement, and water in the proportions and amounts established by the mix design. The cement content normally is to be between 4.5% and 5.5% of the dry weight of the aggregate. The mixture shall be proportioned to provide for a minimum 28-day ultimate compressive strength of 1,000psi. The proportions of the materials will be subject to change as required to meet the herein specifications.

In all plants the weight or rates of feed of aggregates and water shall be within 5% of the amounts of each material that is specified. The weights or rates of feed of cement shall be such that the variations in cement content in samples taken from any part of a mixed batch, or from different batches, or from time to time from the product of continuous mixers, or from mixtures spread on the roadbed shall not have variations above or below the cement content designated by the Engineer of Record of more than 0.5 of a percentage point.

604.02.01 AGGREGATE

The aggregate shall meet the requirements of **Section 603** and shall be crushed rock, including sand conforming to specifications.

604.02.02 PORTLAND CEMENT

Cement to be used shall be Portland Cement Type I or Type II conforming to the requirements of AASHTO M 85 for low alkali cement. The total alkali content shall not exceed 0.8% and the tricalcium aluminate content shall not exceed 10%.

604.02.03 WATER

Conform to the requirements in **Subsection 205.02.03**.

604.02.04 ASPHALT MATERIALS

Conform to the requirements of **Subsection 205.02.10** for the bituminous curing seal.

604.02.05 MIX DESIGN AND CERTIFICATION

Ten days prior to production, the Contractor shall furnish the Project Manager a complete mix design showing the proportions of all constituents proposed for use, and strength test results of samples prepared using the proposed proportions and constituents for a minimum of 7-day, 14-day, and 28-day curing periods. The mixture shall be spread and screeded by specified equipment in one or more layers to provide the compacted thickness called for by the mix design and in accordance with **Subsection 604.03.05**. Also accompanying the mix design, the Contractor shall submit the manufacturer's certification and a copy of test results with respect to the product involved. The certification shall consist of the name of the project, the name and address of the manufacturer, and the testing agency and the date of testing. The certification shall also set forth a means of identification that will permit field determination of the product delivered to the project as being the product covered by the certification.

The Contractor shall be responsible for all costs of certification and testing of products in connection therewith.

604.03 CONSTRUCTION

Preparation of Underlying Course

Prior to the production or placing of CTB, complete all utility work and prepare the subgrade in strict accordance with **Section 601**.

604.03.01 MIXTURE

The CTB mixture shall be mixed at a centrally located plant of the batch type or of the continuous mixing type, capable of providing a mix of aggregate, cement, and water of uniform proportions and consistency as designated by the mix design.

The charging of the materials into the mixer shall be by means whereby the quantities of the several materials are accurately controlled. Mixing shall continue until a uniform and homogeneous mixture of aggregate, cement, and water has been obtained. In general, the time of mixing shall not be less than 30-seconds, except that the time may be reduced when tests indicate that the requirement for the variation of cement content as specified can be consistently complied with.

604.03.02 WEATHER LIMITATIONS

The CTB shall be constructed in accordance with the weather limitations as set forth in **Subsection 208.03.09**.

604.03.03 EQUIPMENT

Equipment used shall conform to the following requirements unless otherwise approved by the Engineer.

604.03.03A HAULING EQUIPMENT

Vehicles for hauling the mixture shall be watertight, agitating or non-agitating, and capable of discharging the mix without waste and with practicable minimum amount of separation.

604.03.03B SPREADING EQUIPMENT

Spreading of the CTB mixture shall be by a machine that has an adjustable screed or strike-off assembly, and it may have a receiving and distribution system. The equipment shall be capable of spreading the material and striking it off to the required thickness and the designated line, grade, and transverse slope without segregation, dragging, or fracture of material. The spreading and screeding equipment may be a complete and integral self-propelled and powered unit; a crawler-track or wheeled-type tractor intimately combined with a receiving, spreading, and screeding unit attached thereto; or, if approved by the Engineer, a heavy-duty, self-propelled grader equipped with at least an 8-foot blade. The screed or strike-off assembly shall operate by an approved action that produces specified results and a surface texture of uniform appearance.

Spreading equipment that rides on freshly spread material and produces tracks or partially compacted areas thereon will be acceptable provided no displacement of material or filling of tracks occur and provided further that the tracks are not of such depth as to be visible after compaction is completed.

If the Contractor so elects, the spreading equipment may be provided with a control system automatically controlling the laying of the mix to specified transverse slope and longitudinal grade by means of actuation from an independent line and grade control reference.

604.03.03C OTHER EQUIPMENT

Equipment shall be provided to apply water by spray method to the CTB mixture during its compaction, the spray attachments being of a type that will produce a uniform and controlled, fine spray. Equipment for application of the bituminous curing seal shall provide application by pressure spray method in a uniform and controlled application. Motor graders shall be available for correction of unavoidable segregation at edges of the mix.

604.03.03D COMPACTING EQUIPMENT

Compaction shall be with vibrating type, pneumatic tire type, steel wheel type, or other approved type compactor, as the Contractor may elect; provided, however, that compactors with lugs, projections, or other features that would leave ruts, holes, grooves, or uneven surfaces in the CTB after compaction or that would loosen the mixture while operating will not be permitted. Either a pneumatic tire roller or a smooth steel wheel roller shall be provided for the final rolling and compacting of the mixture.

604.03.04 HAULING AND PLACING

Maintain the surface of the underlying course in a wet condition by sprinkling just in advance of placing. The CTB mixture shall be delivered and deposited without delay. Mixture that has begun to harden and take an initial set prior to placement, or that has been re-tempered in transit with water, will be rejected and shall be disposed of at the sole expense of the Contractor.

The mixture shall be delivered to the spreading machine by direct deposit in the receiving hopper, by placing in windrows in front of the machine, or by other means acceptable to the Engineer. If material is placed in windrows, it shall be deposited on the roadbed at a uniform quantity per lineal foot; quantity shall be sufficient to provide the required compacted thickness without resorting to excess spotting, picking-up, or otherwise shifting of the mixture. The mixture shall be delivered and placed without hauling equipment operating over any uncured material.

Placing shall be in strip widths a minimum of 10-feet wide.

The depositing and spreading shall progress continuously without breaks insofar as is practicable. Should stoppage of operations be of such duration as to allow the mixture to take its initial set, the Contractor shall construct a transverse construction joint as hereinafter provided.

The mixture shall be spread and screeded to required thickness and to designated line, grade, and transverse slope without segregation, dragging, or fracture of the components of the mixture.

Motor graders shall be used to correct unavoidable segregation at edges and to reprocess minor areas of deficiency.

604.03.05 THICKNESS AND NUMBER OF LAYERS

If the required compacted depth of CTB exceeds 6-inches, it shall be constructed in 2 or more layers of approximate equal thickness. The maximum compacted thickness of any one-layer shall not exceed 6-inches.

604.03.06 CONSTRUCTION JOINTS

When it is necessary, due to the termination of the day's run or to shutdown, to discontinue placing the mixture for a period of time, which will allow the placed mixture to take its initial set, the Contractor shall construct a temporary transverse construction joint. This joint shall be formed with a wooden block, such as a 6-inch thick timber with width equal to or greater that the depth of the course, or with other devices acceptable to the Engineer, extending across the width of the strip and held firmly

against the vertical end of the strip of mixture that is to terminate at the joint. The top of the joint form shall be set true to the slope and grade of the CTB and shall be firm under pressure from compacting equipment. When construction of the CTB is resumed, the form shall be removed without damage to the adjacent CTB.

604.03.07 Compaction

Compaction of the CTB mixture with specified compactors shall begin as soon as it has been spread and shall be continuous until completion. Not more than 60-minutes shall elapse between the start of the mixing and the time of starting compaction of the CTB mixture on the prepared subgrade. Compaction shall begin at edges and shall be controlled to prevent breakdown at the sides of a strip.

Successive passes of the compactor shall be so spaced that no more than 75% of the compactive width of the compactor shall be on an uncompacted area at any time.

During compacting, sprinkling with water by fine spray application shall be done at the time and in the amounts required. Surfaces of uncompacted or partially-compacted mixture shall be kept moist at all times until the bituminous seal has been placed thereon.

Compaction on the completed CTB shall be 95% of the maximum density as determined by ASTM D1557 indicated by the mix design.

604.03.08 Surface Finish

The CTB surface shall parallel the cross section and grade of the finished surface within 0.04-foot and, when tested with a 10-foot straight edge, shall not vary from the testing edge by more than 0.04-foot at any point.

When Portland Cement Concrete (PCC) pavement is to be placed on the CTB, the surface of the CTB at any point shall not extend above the grade established by the Engineer of Record. The specified finish shall be attained by the following method.

After compaction of the final lift, the surface of the CTB shall be brought within the specified tolerances by trimming with a subgrade planner, by motor grader equipped with an electronically controlled blade, or by grinding. Areas on which trimming or grinding is performed shall be rolled until a smooth surface is attained.

The excess material may be used at other locations in the work area provided said excess material complies with applicable specification requirements.

604.03.09 Bituminous Curing Seal

As soon as possible after each layer of the CTB is constructed as hereinbefore specified and while it is still moist, the surface and exposed edges shall be covered with a bituminous curing seal. The liquefied asphalt shall be applied by a pressure spray method at a uniform rate between 0.25 gallon and 0.35 gallon per square yard.

After the curing seal has been applied it shall cure for a period of 4-days and, during this period, no vehicle shall be permitted to use the section. In case of damage to the curing seal after application and during the curing period, the damaged section shall be repaired by resealing at the Contractor's sole expense.

The curing seal on any lift of CTB may be omitted if, within 2-hours after the start of mixing of the preceding lift of CTB, a succeeding lift of material (CTB, bituminous base, or asphalt concrete) is placed over the preceding lift. Vibratory rollers will not be permitted in the compaction of any succeeding lift of CTB, bituminous base, or asphalt concrete during the period of time from 2-hours to 96-hours after the mixing of any of the underlying lifts of CTB.

604.03.10 Care of Work

During the construction of the CTB, the Contractor shall exercise care to protect the work from damage. Following construction of each strip and each layer of the base and following construction of the entire course of the CTB, the Contractor shall perform such work as specified and as the Engineer may determine to be necessary to prevent raveling and rutting, to prevent segregation of materials, and to maintain the layer or course of the CTB to the specified compaction and surface finish – all until the strip, layer, or course is covered by a following layer or course of material as specified or until all work under the Contract Documents is completed.

604.03.11 Modification of Equipment and Methods

On tapers and other areas of irregular shape, limited length, restrictive width, or other conditions where the Engineer determines that full compliance with the above equipment and construction requirements is not practicable, the specified equipment and construction requirements may be modified subject to approval by the Engineer.

604.03.12 Timing of Operations, Adequacy of Organization, and Rejection of Mixture

All operations involved in constructing the CTB shall be so timed and coordinated that, regardless of daily or seasonal variations in weather, temperature, or humidity, such work shall result in a finished CTB conforming in all respects to specified requirements.

In this respect, the Contractor shall provide and have readily available at all times adequate equipment, tools, material, and labor, and shall achieve the hauling, spreading, compacting, and trimming of the CTB mixture within 2-hours after mixing.

Any CTB mixture not placed and trimmed within this 2-hour period shall be subject to rejection, wasting, removal, and replacement as the Engineer determines to be applicable, and all costs involved in such removal, wasting, and replacement shall be borne by the Contractor.

604.03.13 Handling Traffic Over Cement-Treated Base

At locations where traffic must be routed over the CTB, the CTB mixture shall be made with Type III or Type IIIA (high-early strength) cement to expedite development of strength at an early date. Any extra costs of using high-early strength cement shall be considered as incidental to the bid item for cement-treated base.

If the Engineer so directs, traffic over recently constructed CTB shall be controlled as to speed and routing.

604.03.14 Testing

604.03.14A Aggregate and Cement

Aggregate and cement will be subject to acceptance as specified under **Section 205**. Plant mixed mixtures will be subject to final acceptance after blending and mixing either at the plant or place of delivery. Acceptance will be based on periodic sample taking.

When specified the Contractor shall furnish certified laboratory tests that show results of the tests at no expense to the City. The Engineer may do sampling and/or testing of the materials at the sole expense of the Contractor. If evidence of non-compliance with the requirements exists, additional tests may be required to assure that the materials meet the requirements as specified

604.03.14B IN-PLACE SAMPLE

The Engineer shall be permitted to cut samples or take cores, or to require the Contractor to cut samples or take cores, from the full depth of the compacted mixture or from the separate layers and courses thereof for testing purposes and at such locations and at such frequencies as the Engineer determines necessary for proper representation. Sampling shall be at the expense of the Contractor. Where samples have been taken and where the samples show deficiencies according to these specifications, the Contractor shall repair the cuts or cores with like material and shall make repairs to the pavement as directed by the Engineer, all at no expense to the City.

604.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

604.04.01 CEMENT-TREATED BASE

Quantities for CTB will be measured and paid for on a square yard basis. The measurement will be based on the surface length and width up to the specified length and width of the CTB measured to the nearest 0.1-foot and the area measured to the nearest square yard.

Payment for CTB will comprise full and complete compensation for all labor, equipment, tools, materials and incidentals necessary for all of the contract work as specified under or covered by this section.

When neither specified nor listed in the Contract Documents for separate payment, any and all work specified for performance under or covered by this section will be considered as incidental work for which no separate payment will be made.

604.04.02 BITUMINOUS CURING SEAL

The asphalt emulsion used for the bituminous curing seal shall be measured on a square yard basis and shall include only that asphalt emulsion actually incorporated in the seal.

Payment for the asphalt curing seal shall be based on the price stated in the Contractor's Proposal and shall be understood to comprise full and complete compensation for all labor, equipment, tools, materials, and incidentals necessary for all of the contract work as specified under or covered by this section.

When neither specified nor listed in the Contract Documents for separate payment, any and all work specified for performance under or covered by this section will be considered as incidental work for which no separate payment will be made.

605 ASPHALT CONCRETE PAVEMENT

605.01 DESCRIPTION

This section covers work necessary for the construction of hot mix asphalt pavements over prepared foundations or base surfaces. Hot mix asphalt concrete is defined as a mixture of asphalt cement, high quality aggregate well graded, mineral filler and additives as required, heated and plant mixed into a uniformly coated mass; hot laid on a prepared foundation and compacted to specified density.

605.02 MATERIALS

605.02.01 GENERAL

Plant mixed mixtures will be subject to final approval after blending and mixing, either at the plant or at the place of delivery, prior to rolling. Approval will be based on periodic sampling and testing of the materials and visual inspection by the Inspector or Engineer.

605.02.02 ASPHALT CEMENT

Asphalt materials incorporated in the mix shall conform to the requirements of **Subsection 205.02.10B**.

605.02.03 AGGREGATES

Aggregates shall conform to requirements of **Section 205**.

605.02.04 MINERAL FILLER

Mineral filler shall conform to the requirements of AASHTO M 17.

Collector dust may be used as mineral filler, in whole or in part, provided the dust or the resultant mineral filler mixture conforms to the above requirements.

605.02.05 ADDITIVES

Additives may be used to prevent stripping or separation of asphalt coatings from aggregates, and admixtures may be used to aid in the mixing or use of asphalt mixes. Use admixtures and additives of standard, recognized products of known value for the intended purpose, and obtain approval on the basis of laboratory tests prior to their use. They shall have no deleterious effect on the bituminous material and shall be completely miscible. Do not use silicones as an additive.

605.02.06 COMPOSITION AND PROPORTION OF MIXTURES

The class of asphalt concrete to be used shall be as shown and shall conform to the following requirements. Table ranges are inclusive of tolerances.

Table 605.02.06-1 DENSE GRADE ASPHALT

SIEVE SIZE PASSING	DENSE GRADED Percentage of Total Aggregate (by weight)		
	3/4” Dense	1/2” Dense	3/8” Dense
1”	99 – 100	---	---
3/4”	90 – 100	100	---
1/2”	0 – 90	90 – 100	0 – 100
#4	---	---	0 – 90
#8	12 – 49	28 – 58	32 – 67
#200	2.0 – 8.0	2.0 – 10.0	2.0 – 10.0
Asphalt Cement*	4 – 8	3 – 8	4 – 8

*Percent of total mix (by weight).

The amount of new asphalt cement to be added to a recycled mixture will vary from 3% to 8%. Class “B”, “C”, and “D” asphalt concrete shall meet the following qualifying test requirements:

Table 605.02.06-2 TEST REQUIREMENTS		
TEST	**TEST METHOD**	**REQUIREMENTS**
Stability, first compaction	ODOT standard test*	35 min. (residential streets)
		40 min. (all other streets)
Voids, first compaction	ODOT standard test*	7% max.
Voids, second compaction	ODOT standard test*	1% min.
Retained strength	ODOT TM 313	70% min.
*Available from ODOT's Pavement Services Engineer in Salem, Oregon		

605.02.07 MIX FORMULAS

The Contractor may be required to submit a job-mix formula for review by the Engineer.

Job mix formulas shall meet the requirements of ODOT Level 2 mix, except on Local Industrial, Major Collector and all Arterials a formula meeting ODOT Level 3 mix shall be used. For Standard Collectors the Engineer may require ODOT Level 3 mix be used.

Table 605.02.07 JOB MIX FORMULAS		
	LEVEL 2	**LEVEL 3**
Design Method	75 Gyration	75 Gyration
Air Voids, percent	4.0	Base: 4.0
		Wearing: 4.0 – 4.5
Voids in Mineral Aggregate, percent minimum	3/4" – 13.0	3/4" – 13.0
	1/2" – 14.0	1/2" – 14.0
	3/8" – 15.0	3/8" – 15.0
P #200/Eff AC ratio	0.8 to 1.6	0.8 to 1.6
Tensile Strength Ratio, percent minimum	80	80
Voids Filled with Asphalt, percent	65 – 78	65 – 75

The job-mix formula shall indicate the gradation of each of the several aggregate constituents to be used in the mixture and shall establish the exact proportion of each constituent to be used to produce a combined gradation of aggregate within the appropriate limits stated above.

The job-mix formula shall also indicate: ASTM bulk specific gravity of each aggregate constituent; the measured maximum specific gravity of the mix at the optimum asphalt content determined in accordance with ASTM D2041; all properties as stated in **Subsection 605.02.06** of these specifications for at least 4 different asphalt contents other than optimum, 2 of which will be below optimum and 2 of which will be above optimum; the percent of asphalt lost due to absorption by the aggregate; and any other information pertinent to the design of the mix.

605.02.08 RECYCLED ASPHALT PAVEMENT (RAP) MATERIALS PERMITTED

The Contractor shall have the option of using processed recycled asphalt pavement materials in the production of new asphalt concrete pavement. The RAP materials proposed for use in the recycled mix shall contain hard, sound, and durable aggregates and asphalt of a composition to provide properties equivalent to asphalt as specified in these specifications when in the mix. Recycled material that is used in the asphalt concrete pavement shall be no larger than the specified maximum allowable aggregate size prior to entering the cold feed. If there is evidence of the recycled material not breaking down during the heating and mixing of the asphalt concrete mixture, the Engineer may elect to modify the maximum size requirement. Not more than 30% by weight of recycled materials may be used in the mix.

605.02.09 TOLERANCES

After the mix formula is submitted, the several constituents shall meet the following tolerances, but always within the range of proportions specified in **Subsection 605.02.06**:

Table 605.02.09 ASPHALT CONCRETE MIX TOLERANCES	
TOLERANCE (± to job mix formula)	
	Specifications
Aggregate passing 1", 3/4", 1/2" sieves	0%
Aggregate passing 1/4" sieve	5%
Aggregate passing No. 10 & No. 40 sieve	4%
Aggregate passing No. 200 sieve	2%
Asphalt cement	0.5%

Each day the City shall be permitted to take as many samples as she considers necessary for checking the uniformity of the mixture. When unsatisfactory results or other conditions make it necessary, the Engineer may require a new mix formula.

Should a change in source of material be made or should conditions arise that the Engineer determines to be justified, the Contractor shall establish a new job-mix formula.

The materials to be used in the work shall be of such nature that a mixture of them, proportioned in accordance with the mix formula, will have a retained strength of no less than 70% when tested in accordance with ODOT TM 313. The City shall be permitted to take as many samples as he considers necessary for checking the uniformity of the mixture.

605.02.10 FEATHERING

Asphalt concrete for use in feathering at curb or gutter lines, at intersections, at connections with existing pavement, in spot patching, and under similar conditions shall be a fine mix of asphalt concrete such as 3/8-inch mix. Wedge cutting or grinding shall be used when connecting local streets to neighborhood collectors and higher classifications of streets.

605.03 CONSTRUCTION

605.03.01 PRE-PAVING CONFERENCE

The Contractor and his supervisory personnel, plus any subcontractors and their supervisory personnel, who are to be involved in the paving work shall meet with the Project Manager and his representatives for a pre-paving conference at a time mutually agreed upon. At this conference, the Contractor shall discuss his methods of accomplishing all phases of the paving work. The plan of the work, order of paving, and other details of performance shall be approved by the Project Manager.

605.03.02 PREPARATION OF BASES

All pavement bases and foundations constructed under these Contract Documents shall be completed and finished as prescribed under the applicable specification for its construction.

Manholes, inlets, water valve boxes, and other such structures shall have been completed, cured, and otherwise prepared as applicable and made clean and ready for asphalt pavement. Unless otherwise approved, manholes shall be adjusted to designed finish grade prior to paving. If otherwise approved, manholes will be adjusted to finished grade after paving. Paint vertical surfaces that will come in contact with asphalt pavement with tack coat material to provide a good bond and seal. Cover top surfaces with paper or other material to prevent adherence of asphalt pavement, tack coat, or prime coat.

605.03.03 Reconditioning Old Roadbed

This work consists of reconditioning and preparing previously constructed roadbed subgrades, existing stone bases and surfacings, and existing pavements; none of which were constructed by the Contractor under the pertinent Contract, but on which an additional layer or course of material is to be placed.

Existing aggregate subbases, bases, and surfacings shall be bladed, scarified, leveled, and compacted in conformance to lines, grades, and cross sections as established and the density and tolerance requirements of **Section 603**.

Pre-level uneven or broken asphalt, cement concrete, or brick surfaces with asphaltic concrete as specified. Spread and compact pre-leveling asphaltic concrete to the density and surface condition as directed.

605.03.04 Tack Coat

Tack Coat shall conform to **Subsection 205.02.10C.**

Spread asphalt by means of pressure-spray equipment that will provide uniformity of application at prescribed rates. Do not apply aggregate cover material to the tack coat. Asphalt shall be applied to the prepared surface at a residual rate of 0.04 to 0.08 gallons per square yard. The tack coat shall not be applied during wet or cold weather or during darkness; apply only so far in advance as is appropriate to maintain a tacky, sticky condition of the asphalt. Apply tack coat in such a manner as to offer the least interference to traffic and to permit at least one-way traffic without pickup or tracking of asphalt.

Tack coat all edges of existing pavement and manholes and clean out frames, inlet boxes, and like items. Tack the lift of pavement when traffic has been allowed on it prior to subsequent lifts.

605.03.05 Mixing

Mix the asphalt concrete by combining aggregate, asphalt, and additives at an approved central mixing plant equipped with controls to accurately measure and monitor the various components of the mix to produce a uniform, homogeneous mixture at the specified temperature.

The discharge temperature of the mix will vary with the type of mixing plant, climatic conditions, and other variables. However, the temperature shall be sufficient to provide thorough mixing and coating and to provide a mass viscosity of the mix on the grade that will permit compaction to required density. Mix temperatures and asphalt in storage shall generally not exceed 340º F.

605.03.06 Placing

Conform to the Contract Documents for order of paving, lift thickness, and other requirements of performance as approved.

Transport the asphalt concrete mixture from the mixing plant to the point of use in trucks. Send no loads so late in the day as to prevent the spreading and compacting of the mixture during daylight, unless approved lighting is provided. The temperature of hot mix at the time it is spread into final position shall be between 240º F and 302º F.

When the capacity of the paver to properly spread and finish exceeds the rate of delivery of mixture, operate the paver at a reduced and uniform speed to give continuous spreading and finishing.

Take care at all times to prevent segregation in the mixture as evidenced by areas of fine and coarse materials and correct any such segregation with fresh mixture either spread and worked

into the surface or by complete removal and replacement of segregated mixture as deemed appropriate by the Inspector. This work shall be done at no expense to the City. At no time shall the course aggregate segregated from the mix from hand spreading or raking of joints be scattered across the paved mat. Such material shall be collected and disposed of.

On areas to be patched with asphalt concrete mixture and on areas of irregular shape or limited size, the spreading and finishing requirements may be modified as approved by the Project Manager.

Boils and slicks occurring in the pavement must be immediately removed and replaced with suitable materials at the sole expense of the Contractor.

605.03.07 Protection of Structures

Protection of structures must conform to **Subsection 210.03.04F**.

605.03.08 Paving Plant Equipment

All plant and equipment used by the Contractor in the preparation and mixing of asphalt concrete shall conform to the requirements of the edition of the Oregon Standard Specifications for Construction in effect on the date the Notice to Contractors is published.

605.03.09 Weigh Scales

When materials are to be measured for payment by weighing on vehicle scales, the Contractor shall provide the scales and transport the materials to the scales provided.

The vehicle scales furnished shall be accurate within the tolerances required by state law and shall be licensed with the Oregon Department of Agriculture. Scales shall be suitable for the weighing to be done and shall be properly installed and maintained.

At each end of the vehicle scale there shall be a straight approach in the same plane as the platform. The approaches shall be of sufficient length and width to ensure the level positioning of combination vehicles longer than the scale platform during weight determinations. All vehicle brakes shall be released while combination vehicles are being weighed.

Vehicle scales shall be inspected and the accuracy tested every 6 months by either the State Department of Agriculture or a scale service company. Scales installed at a new site shall be inspected and the accuracy tested before use. Testing by a scale service company shall be done by using a minimum of 10,000 pounds of test weights certified by the State Department of Agriculture.

605.03.10 Hauling Equipment

Vehicles used for hauling asphalt concrete mixtures shall have tight, clean, and smooth beds that have been thinly coated with a minimum amount of paraffin oil, lime solution, soapy water or other approved release agent to prevent the mixture from adhering to the beds.

During each application of an approved coating material and prior to loading, the vehicle bed shall be drained of all excess coating material by raising the truck bed, opening belly dump gates, or operating the conveyer belt as appropriate for the type of equipment being used.

Vehicles that cause excessive segregation, that leak badly, or that delay normal operations as such are determined by the Engineer shall not be used.

Contractor's hauling vehicles shall be constructed and equipped with covers to protect against moisture and heat loss, and shall have a 3/8-inch diameter hole near the middle of the left sidewall of the bed to allow access for a thermometer.

605.03.11 ASPHALT CONCRETE PAVERS

Pavers shall be self-contained, power-propelled units provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing layers of asphalt concrete material in lane widths applicable to the specified typical sections and to required thicknesses, lines, grades and cross sections.

Extensions added to the paver when used on travel lanes shall have the same augering and screeding equipment as the rest of the paver.

The paver shall be equipped with a receiving and distribution system of sufficient capacity for a uniform spreading operation and be capable of placing the mixture uniformly in front of the screed without segregation of materials.

The paver shall be designed to compensate for minor irregularities of the base on which it is supported so that such will not be reflected immediately in the surface of the layer being placed. The weight of the paver shall be supported on tracks or wheels, none of which shall contact the mixture being laid. The contact area of the screed or strike-off assembly shall be uniform over the entire width of the strip of mixture being placed.

The screed or strike-off assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. The paver shall be equipped with either a manual or electronic line and grade control.

605.03.12 WEATHER LIMITATIONS

Asphalt concrete mixtures shall be placed on dry prepared surfaces when the air temperature in the shade and the surface temperature is not less than those specified in the following table:

Table 605.03.12 SURFACE TEMPERATURE LIMITATIONS

COMPACTED THICKNESS OF INDIVIDUAL COURSES:	TRAVEL LANES/WEARING COURSE	ALL OTHER COURSES
Less than 1½ inches	60º F	55º F
1½ inches to 2½ inches	50º F	45º F
Over 2½ inches	40º F	35º F

Placing of any mixture during rain or other adverse weather conditions normally will not be permitted except that mix in transit at the time these adverse conditions occur may be laid if of proper temperature, if the mix has been covered during transit, if placed on a foundation free of pools or flow of water, and if all other requirements of these specifications are met. Asphalt concrete mixtures shall not be placed when the underlying layer is frozen or when, in the opinion of the Engineer, weather conditions either existing or expected will prevent the proper handling, finishing, or compaction of the mixtures.

605.03.13 COMPACTION

The Contractor will not be permitted to use any equipment that crushes the aggregate to any extent. The Contractor will be required to obtain the densities required in **Subsection 605.03.15**.

605.03.14 COMPACTORS

Rollers shall be steel wheel, vibratory, pneumatic tire, or a combination of these types as the Contractor may elect. They shall be in good condition and capable of reversing without backlash.

605.03.14A STEEL WHEEL ROLLERS

Steel wheel rollers shall have a minimum gross static weight of 8 tons and a minimum static weight on the drive wheel of 250 pounds per inch of width. For finish rolling a 6-ton minimum gross static weight is acceptable and the 250 pounds per inch of width will not be required.

605.03.14B VIBRATORY ROLLERS

Vibratory rollers shall be equipped with amplitude and frequency controls and shall be specifically designed for compaction of asphalt concrete mixtures. The rollers shall be capable of frequencies of not less than 2,000 vibrations per minute and a static weight of 8 tons.

605.03.14C PNEUMATIC TIRE ROLLERS

The pneumatic tire rollers shall be self-propelled, tandem, or multiple axle, multiple wheel type with smooth-tread pneumatic tires of equal size staggered on the axles at such spacings and overlaps as will provide uniform compacting pressure for the full compacting width of the roller and shall be capable of exerting ground pressures of at least 800 pounds per square inch of tire contact area. Pneumatic tire rollers shall be fully skirted to insulate the tires from significant heat loss during compaction.

605.03.15 DENSITY REQUIREMENTS

The density of asphaltic concrete shall be at least 91% of Rice theoretical maximum density as determined in conformance with AASHTO T 209.

Asphaltic concrete pavements that do not meet the requirements for compaction and are deemed by the Engineer to be not suitable for use will be rejected and removed at no cost to the City.

Asphaltic concrete pavements that do not meet the requirements for compaction but are deemed by the Engineer to be suitable for use may be left in place if the Contractor so elects.

Samples and tests will be taken as frequently and at such locations as the Engineer elects, and the results will be made known to the Contractor as soon as practical. However, it shall be the responsibility of the Contractor to obtain specified density at all times and delay in advising the Contractor of test results shall not act as a waiver of this responsibility. When it is determined that specified density is not being obtained, discontinue all paving operations until corrective measures have been taken.

Any displacement occurring as a result of the reversing of the direction of a roller or from other causes shall be corrected at once by the use of rakes and addition of fresh mixture when required. Do not displace the line and grade of edges. Moisten steel roller wheels with water or other approved material to the least extent necessary to prevent pickup of mixture and yet not cause spotting or defacement of the surface of the mixture.

Along curbs and walls, on walks, irregular areas, and other areas not practicably accessible to specified rollers, compact the mixture with small rollers, mechanical tampers, hot hand tampers, or smoothing irons. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area. Top lift of AC shall be minimum of 1.5-feet in width, mechanically compacted such that no bridging of work area by compacting equipment occurs.

Remove and replace any mixture that becomes loose and broken, mixed with dirt, or is defective in any way. Remove and replace any area showing an excess or deficiency of bituminous cement. Removal and replacement under these provisions shall be at the sole expense of the Contractor.

605.03.16 TRANSVERSE JOINTS

Form transverse joints by cutting back on the previous run to expose the full depth of the layer or course.

Place a course or strip of asphalt concrete as nearly continuous as practicable. Carefully construct transverse joints using vertical faces and thoroughly compacted to provide a smooth riding surface. Apply a coat of bituminous material to contact surfaces just before mixture is placed against previously rolled mixture. The Contractor shall use a 12-foot straight edge to determine the location of the full depth vertical faces.

At bridge ends or at joints with other rigid type structures, existing bases shall be conditioned and compacted and place asphalt concrete to extra thickness and compact in transverse direction as well as longitudinally.

When the end of a course or strip of asphalt concrete is to be temporarily subject to traffic, the end shall be left on a bevel of approximately 20:1 (horizontal to vertical) being later cut back to a vertical edge.

605.03.17 LONGITUDINAL JOINTS

Before any paving is started the Contractor shall submit to the Project Manager for review a drawing indicating locations of longitudinal joints.

The mixture shall be laid in strips of such widths as to hold to a practical minimum the number of longitudinal joints required. Longitudinal joints in the wearing course shall not occur within the area or width of a traffic lane or auxiliary lane. On median lanes and on shoulder areas such joints shall occur only at points of change in the transverse slopes as shown on the plans or designated by the Engineer. The longitudinal joints in one layer shall offset those in the layer immediately below by a minimum of 6-inches. Underlying longitudinal joints shall be within 12-inches of the edge of a lane or within 12-inches of the center of a lane, except in irregular areas or if otherwise shown on the plans. Joints shall not be located in wheel paths.

When the end of a course or strip of asphalt concrete is to be temporarily subjected to traffic, the end shall be on a bevel of approximately 20:1 (horizontal to vertical). Install paper joint, grind, or cut back to a vertical edge to provide a fresh surface against which subsequently placed asphalt concrete is to abut.

When placing of asphalt concrete pavement in layers in excess of 2-inch nominal thickness is being performed under traffic, work shall be scheduled in a manner such that at the end of each working day the full width of the area to be paved shall be completed to the same elevation with no longitudinal drop-offs within this width.

When placing of asphalt concrete pavement in layers of 2-inches or less in thickness is being performed under traffic, work shall be scheduled in a manner such that at the end of each working shift one strip of new travel lane pavement shall not extend ahead of the adjoining strip of travel lane pavement more than the distance normally covered by each shift.

Where abrupt or sloped drop-offs occur at the edge of the paved surface, the Contractor shall construct and maintain a wedge of asphalt concrete at a slope of 10:1 or flatter along the exposed joint.

605.03.18 THICKNESS AND NUMBER OF LAYERS

In case the course of pavement involves the placing of a layer of variable thickness as for leveling existing irregular surfacings, the course may include or consist of a layer of asphalt concrete of variable compacted thickness, the thickness of which layer shall not exceed the following:

Table 605.03.18 COMPACTED THICKNESS LAYERS		
TYPE OF MIX	**MINIMUM**	**MAXIMUM**
3/4”	3-inches	3-inches
1/2”	2-inches	3-inches
3/8”	1-inch	2-inches

The top surface of each layer of asphalt concrete shall be spread at grade and cross section closely paralleling the specified top surface of the finished pavement.

605.03.19 PAVEMENT SAMPLES

The Engineer shall be permitted to cut samples or to take cores from the full depth of compacted mixture or from the separate layers and courses thereof for testing purposes, and at such locations and at such frequencies as the Engineer determines necessary for proper representation. Where samples have been taken and when directed by the Engineer, the Contractor shall furnish new like material for filling the holes at no cost to the City.

605.03.20 PAVEMENT SMOOTHNESS

The top surface of the asphalt concrete pavement, when tested with a 12-foot straightedge furnished by the Contractor, shall not vary by more than 0.02-foot either parallel to or perpendicular to the centerline. The Inspector will observe this testing and may require additional testing. The means of correction of a surface that does not meet the smoothness requirements shall have the approval of the Engineer.

When tests show the pavement is not within the above tolerances, the Contractor shall take immediate action to correct equipment or procedures in his paving operation to eliminate the unacceptable pavement roughness.

Any surface irregularities exceeding the above tolerances shall be corrected by the Contractor using a method or methods listed herein and approved by the Engineer.

1. Remove and replace the surface course.
2. Place an overlay of a thickness approved by the Engineer.
3. Grind the pavement surface utilizing diamond blades up to a maximum depth of 0.3-inch and apply an emulsion fog coat as directed by the Engineer.

Unless otherwise directed, all corrective work shall be completed within 10 working days following notification from the City that the pavement does not meet the specified tolerances.

All corrective work, including furnishing of materials, shall be performed at no expense to the City. On publicly financed improvement projects, no adjustment in contract time will be made for corrective action work.

605.03.21 SPECIAL PROTECTION UNDER TRAFFIC

In addition to other required provisions for traffic, the following shall apply to pavement construction:

- No traffic or equipment shall come in contact with the compacted mixture until it has cooled and set sufficiently to prevent marking,
- Edges shall be protected from being broken down, and
- Edge drop-offs one or more inches in height shall be marked with warning devices visible by day and night to the traveling public and placed at spacings indicated on the plans or as directed by the Engineer.

605.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Pay quantities for hot mix asphalt concrete and other asphalt construction under this section will be measured by one of the methods as set forth hereinafter.

A deduction of 1% of the in-place price will be made for each 1% cumulative deviation from the allowable tolerance of each component of the job mix formula required by the specification, except as follows:

- Deviations in asphalt cement shall be weighted 8 times; deviations in #200 minus material shall be weighted 2 times the deviation in other specified aggregate sieve sizes.
- All materials furnished where the cumulative deviation equals or exceeds 12% shall be removed and replaced with acceptable material at the sole expense of the Contractor.
- When asphalt paving materials with a cumulative deviation of less than 12% are furnished, the City shall notify the Contractor, in writing, to remove and replace defective materials at the sole expense of the Contractor or to pay to the City liquidated damages in accordance with the above deduction schedule.

605.04.01 ASPHALT CONCRETE ON TON BASIS

When pay items in the Contract Documents so indicate, the quantity of asphalt concrete used in the accepted work as specified will be measured and paid for on a ton basis. There will be no separate measurement of bituminous cement or additives contained in the mixture or used otherwise in the work. Measurement will be made on the number of tons of asphalt concrete as weighed on approved and tested scales. Give trip tickets to the City as the material is delivered. Each trip ticket shall show date and time of delivery, truck number, driver's name, and net weight of material and will be considered as valid delivery receipts only so provided. No material will be accepted or paid for without a trip ticket being available at the time of delivery.

When the pavement is found deficient in thickness by more than 0.2-inch, but not more than 1-inch as determined by test cores of reasonable test samplings, payment for pavement will be made by adjusting the unit price downward 4% for each tenth of an inch below the specified depth. Pavement found deficient in thickness by 1-inch or more will not be accepted or paid for.

When the pavement is found deficient in required density a price reduction for such materials will be determined as follows: The percentage below the required density will be squared and then rounded off to the nearest whole figure and a percentage deduction made to the in-place price equal to the results. Any pavement with a density less than 89% will not be considered suitable.

605.04.02 ASPHALT CONCRETE ON SQUARE YARD BASIS

When the pay items in the Contract Documents indicate specific class and thickness, asphalt concrete complete-in-place as specified and accepted will be measured and paid for on a square yard basis. Measurement will be made of width and length of each separately constructed strip

of pavement wherein width is the design width or edge to edge width of pavement, whichever is the lesser, and length is from end to end of the pavement along the center of the strip. Measurement will be on the surface of the pavement to the nearest 0.1-foot and the square yardage will be to the nearest full square yard.

The Engineer may take core samples of the pavement or use other methods to determine the actual pavement thickness constructed. Extra thickness of pavement as shown or as directed will be measured by conversion on a proportionate volume basis to an equivalent number of square yards of specified standard thickness pavement.

No additional payment over the Contract Documents unit price will be made for pavement having a thickness greater than shown or directed. When the pavement is found deficient in thickness by more than 0.2-inch, but not more than 1-inch as determined by test cores of reasonable test samplings, payment for pavement will be made by adjusting the unit price downward 4% for each tenth of an inch below the specified depth. Pavement found deficient in thickness by 1-inch or more will not be accepted or paid for.

When the pavement is found deficient in required density a price reduction for such materials will be determined as follows: The percentage below the required density will be squared and then rounded off to the nearest whole figure and a percentage deduction made to the in-place price equal to the results. Any pavement with a density less than 89% will not be considered suitable.

606 Portland Cement Concrete Pavement

606.01 Description

This section covers work necessary for construction of Portland Cement Concrete pavements, with or without reinforcement, on a prepared subgrade or base course complete.

606.02 Materials

All material shall conform to requirements of **Section 205**.

606.03 Construction

606.03.01 General

The plant, equipment, and tools required in the performance of the work must be of the design, capacity, and in condition to efficiently perform their respective functions of the work. Schedule and coordinate all operations involved in constructing the pavement so that regardless of the daily or seasonal variations in weather, temperature, and humidity under which the work is permitted to proceed, such work will result in a finished pavement conforming in all respects to specified requirements. Provide and have available at all times adequate equipment, tools, materials, and labor to achieve these results. Failure to so provide will be cause for discontinuance or rejection of the work as determined by the Project Manager. Conform to applicable requirements of concrete construction in **Section 208**.

606.03.02 Preparation of Concrete Mix

Before beginning any concrete work, the Contractor shall have the concrete mix designed and submit the mix design for approval. The mix design shall be tested by a laboratory approved by the Engineer and by preparing trial batches of which 4 standard test cylinders shall be cast, cured, and tested as specified for the concrete. Certified copies of all laboratory reports stating whether or not the

items reported meet specifications shall be sent directly to the Project Manager from the testing laboratory.

Portland Cement, fine aggregate, coarse aggregate (in required separated sizes), water, air-entraining agents, and other admixtures as required shall be used in the concrete in such proportions as may be determined to be necessary to produce a concrete of suitable workability, plasticity, and entrained-air content and of such strength as required. The proportions may be changed by the Engineer of Record during the progress of the work, but they shall at no time be such that test cylinders of the resultant concrete made in accordance with the applicable provisions of AASHTO T 23 will show compressive strengths of less than 5,000 pounds per square inch or as specified in the Contract Documents at an age of 28-days, whichever is greater.

The 28-day strength test value shall be the average compressive strength of 3 cylinders tested in accordance with AASHTO T 22. If the compressive strength of a single test specimen varies by more than 10% from the average of the other 2 specimens taken during the same pour, that compressive strength value shall be disregarded and the average compressive strength test of the 2 remaining specimens will be used. The 28-day strength test value shall not be less than the specified strength for the mix design.

Changes in proportions, and particularly in the proportion of cement, may be made not only for the purpose of causing the concrete to meet specified 28-day requirements, but also to produce concrete of high-early strength when concrete of that kind is required. The maximum amount of cement to be used shall be 750 pounds per cubic yard of concrete.

The proportions of water to be used shall be determined by the Engineer of Record, it being the intent of the specification to have the water/cement ratio held as low as is consistent with the production of a workable, uniform, and dense concrete. The maximum water/cement ratio shall be 6-gallons of water per 94 pounds of cement.

Entrained air in the concrete shall be as directed by the Engineer of Record and will be from 4% to 6% by volume. The entrained air shall be obtained by use of air-entraining cement, by air-entraining additives or admixtures, or by combinations thereof.

The Contractor shall provide and use approved means for adding controlled amounts of additives, admixtures, and retardants to the mix.

No change in the source or character of any material shall be made without due notice to the Engineer of Record and the Project Manager. No material shall be used in the mix until the Engineer of Record has approved such material and has designated the proportions of the materials in the mix based on the use of such approved materials.

606.03.03 Hauling

Hauling of Portland Cement Concrete mixed at a central plant or in transit will conform to the provisions of **Section 208**.

606.03.04 Forms

Conform to the applicable requirements of forms in **Subsection 208.03.07**.

606.03.05 Handling and Placing

Conform to requirements for handling and placing in **Subsection 208.03.10***.*

During the placing of concrete, make provisions for the construction of joints and the placing of dowels, tie bars, and other devices as shown.

606.03.06 PREPARATION OF ROADWAY

Before beginning paving operations, the base constructed under the Contract Documents shall be in accordance with the applicable specification for its construction. Old base and foundations constructed under other contracts shall be brought, by the Contractor, to an acceptable condition as prescribed in **Subsection 605.03.03** by the Contractor.

In addition to the base under the pavement, an area of sufficient width alongside the pavement base that will support the paving equipment shall be brought to proper grade and compacted so as to support the equipment at proper grade and cross section. The base for the pavement shall be maintained and firm and true to established grade and cross section until the concrete is placed thereon.

Manholes, inlets, and other such structures shall have been completed, adjusted, cured, and otherwise prepared, as applicable, and made clean and ready to have concrete placed in contact therewith. Manhole frames and other independent metal structures in the pavement area shall be painted with suitable asphalt material.

The conditioned base shall be in a compacted and smooth condition when the concrete is placed thereon and shall be moist. Watering of the base shall be thorough and uniform.

The Engineer shall be permitted to place plates on prepared base and to reference them for later determination of thickness of concrete; the Contractor shall exercise care to preserve such plates from displacement.

606.03.07 WEATHER LIMITATIONS

Except with written permission from the Engineer, construction of Portland Cement Concrete pavement shall not be in progress or continued when a descending air temperature in the shade and away from artificial heat reaches 35º F. Unless otherwise permitted, the temperature of the mix shall be not less than 50º F or more than 80º F at the time of placing. Material containing frost or lumps of hardened material shall not be used.

Concreting operations shall be discontinued if there is insufficient natural light, unless an adequate and approved artificial lighting system is provided and operated.

When concrete is being placed during cold weather and the air temperature may be expected to drop below 35° F, a sufficient supply of blankets as specified in **Subsection 208.03.09C** shall be provided along the work. Any time within 7-days of placing the concrete the air temperature may be expected to reach the freezing point, the material so provided shall be placed over the pavement to prevent freezing of the concrete. Any concrete injured by frost action shall be removed and replaced at the Contractor's expense.

The Contractor shall have available at all times materials for the protection of the edges and surface of the unhardened concrete from the effects of rain or other precipitation. Protective material may consist of sheets of burlap, paper, or plastic film. It will be the Contractor's responsibility to protect the pavement from damage, and failure to properly protect unhardened concrete may constitute cause for the removal and replacement of defective pavement at no expense to the City.

606.03.08 SLIP FORM PAVING

Place the concrete uniformly in final position by the slip-form method in one complete pass in such a manner that a minimum of finishing will be necessary to provide a dense and homogeneous pavement in conformance to true grade and cross section. The machine shall vibrate the concrete for the full width and depth of the pavement being placed. Such vibration shall be accomplished with vibrating tubes or arms working in the concrete. The sliding forms shall be rigidly held together to

prevent spreading of the forms. Use forms of sufficient length so that no appreciable slumping of the concrete will occur.

Operate the slip form paver with as nearly continuous forward movement as possible and coordinate all operations of mixing, delivery, and spreading concrete to provide uniform progress. Stopping and starting the paving machine shall be held to an absolute minimum. If, for any reason, it is necessary to stop the forward motion of the paver, stop the vibratory and tamping elements immediately. Apply no tractive force to the machine except that which is controlled from the machine. The Contractor shall stop his operation immediately if the finished work is not of specified quality. Deficient areas shall be repaired before the concrete starts to set.

Ensure that supports of the slip-form paver and other equipment that ride on previously placed pavement are offset over that pavement sufficiently to prevent breakage of the edge thereof and provide such supports with suitable protective means to avoid marring or chipping of the previously placed pavement.

Hand-spreading and distributing shall be with shovels, not rakes, and the concrete shall not be fouled with foreign matter, nor shall joint devices be disturbed during such operations. The Contractor shall furnish hand operated mechanical vibrators of a type and design approved by the Engineer. These vibrators shall be used in the consolidation of the concrete pavement within at least 6-feet on each side of construction and expansion joints and such other areas as the Engineer may direct.

During the placing of concrete, provision shall be made for the construction of joints and the placing of dowels, tie bars, and other devices as called for by the plans or as directed by the Engineer.

Concrete that is not in place within 90-minutes after being mixed (or 1-hour if mixed at a central plant or in transit) shall be subject to rejection and wasting at the direction of the Engineer. Concrete that has begun to harden or take an initial set prior to placement, or that has been re-tempered with water will be rejected and shall be wasted by the Contractor in an approved manner and at no expense to the City.

606.03.09 Tamping and Screeding

Compact the concrete pavement by means of vibrating screeds, mechanical tampers, tamping templates, and such other implements as approved. A vibratory screed or an automatic screeding and tamping machine may be substituted for a tamping template, subject to approval by the Engineer. Operate the equipment in such a manner that a satisfactory compaction of the concrete is produced and the surface of the pavement is uniform, true to grade and cross section.

Immediately after placing concrete upon the subgrade and before initial set has occurred, strike off the concrete and tamp by means of a tamping template used at right angles to the centerline of the street until the concrete is thoroughly consolidated to specified grade and crown section, and sufficient mortar is brought to the surface for finishing purposes. If the design or location of the base is such as to preclude the possibility of tamping as previously described (such as a variable crown section, curb being constructed monolithic with base or where the grade exceeds 10%), employ other approved methods to obtain the prescribed results.

606.03.10 Finishing

After the concrete is placed and compacted, strike it true to line, grade, and cross section as shown and float to a smooth, even texture with an approved long-handled wood float having a troweling or smoothing surface from 6 to 12-inches wide, or other approved floating device. Apply the float to the surface of the concrete with its length parallel to the centerline of the street and operate it

from bridges, planing off the high places and filling the low places. Lap preceding applications of the float by at least one-half its length. If, after such planing, low places are discovered in the surface of the concrete, add material to meet specified grade, cross section, and surface tolerance with a surface free from laitance, soupy mortar, marks, or irregularities.

Fill any areas of minor honeycomb or other minor defect in composition of the concrete along the exposed edges with a stiff mortar or cement and fine aggregate applied to the moistened concrete in a workmanlike manner. Areas showing serious defects in composition of the concrete shall be cause for removal of affected pavement and replacement with pavement of specified quality for the full width of strip between longitudinal joints or edges and for a length not less than 10-feet.

Tool the free edges of new pavement and joints with previously placed Portland Cement Concrete with an approved edging tool to remove laitance and mortar resulting from finishing operations and to provide a clean rounded edge to the new pavement. Tooling shall not form ridges on the surface of the concrete. Perform tooling of edges at transverse joints and longitudinal joints are directed.

Upon completion of the floating, straightedge testing, and edge-tooling, and before initial set of the surface concrete, give the surface of the concrete a textured finish. Accomplish the textured finish with a steel-tine tool with ⅛-inch tines that will mark the finished concrete to a depth of ⅛-inch to 3/16-inch. Randomly space the markings from ½-inch to 1¼-inch as approved. Avoid overlaps of the texturing. Markings shall be transverse to the roadway centerline and full roadway width.

606.03.11 Joints

Conform to applicable requirements of **Section 208**.

606.03.12 Tolerances

At the conclusion of the finishing operation, the surface of the pavement shall not vary from a true surface, when tested with a 12-foot testing straight-edge, more than 0.02 of a foot in 12-feet.

The finished surface shall not vary more than 0.03-foot from the design elevations at any point.

If the surface smoothness of the pavement after curing is found to exceed the tolerance permitted, grind the high spots until they meet the tolerance. The practicable extent of grinding shall not exceed 0.5-inch, nor create spalling of aggregate, nor create deficiencies in pavement thickness. If approved by the City, low spots, if in hardened concrete, may be filled with an approved epoxy grout provided such filling is performed in a neat, workmanlike manner and blended inconspicuously with adjoining concrete. All repairs to be at no expense to the City.

606.03.13 Curing and Protection of Concrete

Cure and protect concrete in accordance with **Subsections 208.03.14 and 208.03.15**.

606.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

606.04.01 Portland Cement Concrete Pavement

Measurement of Portland Cement Concrete pavement will be made on a square yard basis for the pavement complete-in-place as specified and accepted. Measurement will be made of width and length of each separately constructed strip of pavement, wherein the width is the design width or edge-to-edge width of pavement, whichever is the lesser, and the length is from end to end of pavement to the nearest 0.1-foot and the calculated square yardage shall be to the nearest square yard.

Extra thickness of pavement, when shown or specifically directed to be placed, will be measured by conversion on a proportionate volume basis to an equivalent number of square yards of specified standard thickness pavement.

Payment will be made on a square yard basis for any or all of the following items when listed as pay items in the Contract Documents for any particular contract:

- Continuously Reinforced Concrete Pavement (specify class, thickness, reinforcing steel)
- Reinforced Concrete Pavement (specify class, thickness, reinforcing steel)
- Plain Concrete Pavement (specify class, thickness)

Payment for concrete pavement, whether continuously reinforced, reinforced, or plain shall be full compensation for furnishing and placing all materials including, but not limited to, water, reinforcement, joint materials, dowels, tie bars, and performing all work specified to complete the item including preparation of the base.

607 Curbs, Gutters, Driveways, and Sidewalks

607.01 Description

This section covers work necessary for the construction of curbs, gutters, combination curb and gutter, combination of curb, gutter and sidewalk, islands, traffic separators, driveways, sidewalks, and pathways, hereinafter referred to collectively as structures. Conform to applicable requirements of **Section 208**.

607.02 Materials

607.02.01 General

Materials shall conform to requirements of **Section 205** and to additional requirements contained herein.

607.02.02 Portland Cement Concrete

Portland Cement Concrete shall conform to **Subsection 205.02.09** except that extruded curbs and/or gutters shall have a maximum slump of 2-inches and shall have aggregates graded within the following limits:

Table 607.02.02 AGGREGATE GRADATION	
SIEVE SIZES	**TOTAL PASSING PERCENT BY WEIGHT**
1/2”	100
3/8”	75 – 100
No. 4	50 – 75
No. 16	20 – 40
No. 50	5 – 15
No. 100	0 – 5

607.02.03 Aggregate

Aggregate materials for base, foundation, leveling courses, or bedding shall conform to the 3/4"-0” or 1”-0” gradation in **Subsection 206.02**.

607.02.04 Wire Fabric Reinforcement

Welded wire fabric shall conform to ASTM A185.

607.03 Construction

607.03.01 Preparation of Base

607.03.01A Earthwork

When roadway earthwork is called for in connection with other items of work under the same Contract Documents that include structure construction under this section, all excavation, backfilling, and berm construction for the structures and in the vicinities thereof as required or as shown shall conform to applicable requirements of **Section 206**.

607.03.01B Aggregate Foundation or Bedding

Construct sidewalk structures on aggregate foundation course or bedding of selected granular material as specified.

When structures are to be constructed on areas where approved aggregate material is already in place, such materials may be salvaged and reused as bedding.

Foundation courses or beddings involving the furnishing of new materials shall be constructed in conformance to the applicable requirements of **Section 603**.

607.03.01C Base for Portland Cement Concrete

All bases upon which new cement concrete structures are to be constructed shall be firm and free of all deleterious matter. Thoroughly dampen surfaces upon which new cement concrete is to be placed. No separate payment will be made for water and the work of placing base materials. The cost of preparing bases shall be considered as incidental to the construction of structures. See **Subsections 601.03.08 and 603.03.04** for compaction requirements.

When new concrete is placed by the mechanical extrusion method, if approved by the Engineer, vertical dowel fastening to underlying concrete or asphalt may be eliminated when the bond between new concrete and underlying concrete or asphalt is provided with epoxy cement applied in conformance with the manufacturer's recommendations. Spread epoxy at a rate that will provide a thorough coating to the surface with all voids and depressions filled. Place new structure on the epoxy cement within 15-minutes after spreading.

607.03.02 Forms

Conform to requirements for forms in **Subsection 208.03.07**.

607.03.03 Equipment

Conform to the requirements of **Sections 605 and 606** unless otherwise specified herein by the Engineer. For asphalt sidewalks or islands, spread asphalt concrete by small or special pavers, by spreader boxes, or by blade graders. Compact with small, self-propelled rollers, vibratory compactors, or mechanical tampers. Spread or compact the mixture by hand methods only when approved.

The machine for extruding cement concrete curb shall be of the self-propelled type equipped with a material hopper, distributing screw, and adjustable curb forming devices capable of placing and compacting cement concrete to the lines, grades, and cross section as shown in an even homogeneous manner.

Set top of curb grade by an offset guideline using the survey marks established by the Engineer of Record. The forming tube portion of the extrusion machine shall be readily adjustable vertically during the forward motion of the machine to provide, when necessary, a variable height of curb conforming to the predetermined curb grade. A grade line gauge or pointer shall be attached to the machine in such manner that a continual comparison can be made between the curb being placed and established curb grade as indicated by the offset guideline.

In lieu of the above method for maintaining the curb grade, the extrusion machine may be operated on approved rails or forms set at the proper relative grade.

607.03.04 Placing Material

No asphalt or cement concrete shall be placed until the surface and forms, where used, have been inspected and approved.

607.03.04A Portland Cement Concrete

Construct Portland Cement Concrete structures between specified forms or by a mechanical extrusion method as the Contractor may elect. If forms are used, maintain a 2 to 4-inch slump and thoroughly compact and strike off. If the structures are constructed by a mechanical extrusion method, maintain a maximum slump of 2-inches. Feed cement concrete into the extruding machine at a uniform rate and operate the machine under sufficient restraint in a forward motion to produce a well-compacted mass of concrete.

607.03.05 Finishing

607.03.05A General

Construct all structures within ¼-inch of true line and within ¼-inch of established surface grade, cross-section, and slope and within ¼-inch of specified thickness; all finished surfaces shall be free from humps, sags, or other irregularities. When a straightedge 12-foot long is laid on a finished surface, the surface shall not vary more than 0.02-feet from edge of the straightedge.

Where Portland Cement Concrete sidewalks or pathways are to be placed around or adjacent to manholes, pipe inlets, or other miscellaneous structures, form around the miscellaneous structure and allow one panel of clearance. After the sidewalk is poured and cured, adjust miscellaneous structures to grade and finish placing the sidewalk or pathway panel(s).

607.03.05B Portland Cement Concrete

Finish surface of concrete to grade and cross section with a bull float, trowel smooth, score if required, and then finish with a broom. Use floats of not less than 10-feet in length for straight grade sections and not less than 6-inches in width. Light brooming shall be transverse to the line of traffic; if water is necessary it shall be lightly applied to the surface immediately in advance of brooming. All joints shall be finished with a 1/2-inch radius steel edging tool.

The surface of concrete shall be scored/jointed into squares based on full width. For widths greater than 7-feet, scoring and dimensions shall be as directed by the Engineer. The faces that are to be exposed shall be free from chips, cracks, air holes, honeycomb, or other imperfections. If portions of the work are deemed unacceptable by the Engineer, they shall be removed and replaced between the nearest joints at no expense to the City.

Curbs:

All concrete curbs shall be cast-in-place.

Remove forms after the concrete has taken initial set and while the concrete is still green. Minor defects shall be repaired with mortar containing 1-part Portland Cement and 2-parts sand. Plastering will not be permitted on the faces and exposed surfaces. Structurally defective concrete shall be removed and replaced at no expense to the City. While the concrete is still green, finish exposed surfaces as required to provide a uniform texture and smooth surface.

When constructing concrete curbs, the proportions of sand, gravel, and cement, the type of forms used (if applicable), and the method of compacting the concrete in the forms shall all be such that as dense, smooth, and uniform a surface as is practicable for a concrete masonry unit will be obtained on the finished curb.

Furnish and install a minimum of two 3-inch PVC Schedule 40 pipe curb drains to serve each lot per **Standard Detail 620, Monolithic Curb and Gutter or Standard Detail 621, Type 'C' Curb**. Curb drains shall be installed during curb construction. In cases where curb drains are installed in existing cured concrete curbs, the curb must be core drilled. Breaking or sawing out sections of the curb for curb drains will not be permitted. PVC pipe shall conform to ASTM D2241.

607.03.06 Curing Portland Cement Concrete

After the concrete has been placed and finished in structures as specified, it shall be cured by application of a white pigmented, liquid membrane-forming compound applied uniformly to the damp concrete by pressure spray methods according to **Subsection 208.03.14**. The concrete structure shall be kept free from contact, strain, and public traffic for at least 7-days.

607.03.07 Joints in Portland Cement Concrete

Contraction Joints in Walks and Incidental Surfacing:

Form transverse contraction joints of the weakened plane in the exposed surfaces of concrete walks and incidental surfacings at such locations as are required to confine the contraction joint spacing to a maximum of 15-feet. The joints shall be formed to a depth of 1/3 of the thickness of concrete and to a width of about 1/8-inch. Joint edges shall be tooled to 1/2-inch radius. Contraction joints should coincide with joints in curbs. Add contraction joints as directed by the City Inspectors.

Contraction Joints in Curbs:

Place contraction joints in curbs at intervals not exceeding 15-feet. Contraction joints shall be of the open joint type and shall be provided by inserting a thin, oiled steel sheet vertically in the fresh concrete to force coarse aggregate away from the joint. The steel sheet shall be inserted 1/2 the depth of the curb. After initial set has occurred in the concrete the steel sheet shall be removed with a sawing motion. Joint edges shall be tooled to 1/2-inch radius. Contraction joints of curbs should coincide with joints in sidewalks and streets. Add contraction joints as specified by the City Inspectors.

Expansion Joints:

Transverse expansion joints for curbs shall be provided opposite abutting expansion joints in Portland Cement Concrete and over expansion joints in concrete underlying the new concrete. Additional transverse expansion joints shall be provided at other locations as required to confine the expansion joint spacing to the maximum distance indicated on the plans. The width of joint and thickness of filler shall match those of the joints in abutting or underlying concrete, and elsewhere shall be ½-inch. Each expansion joint shall be at right angles to the structure alignment, normal to the structure surface, and shall provide complete separation of new concrete.

Expansion joints for sidewalks and driveways shall be provided around poles, pipes, and conduit that protrude through, into, or against the structures, and alongside or transverse to the new

surfacing at such locations and frequencies as is necessary to provide for expansion of both new and abutting Portland Cement Concrete.

Requirements Near Existing Structures:

Cut back existing curbs, walks, driveways and other such structures to permit the new construction; where the new structures are to be constructed against or within 4-inches of the end, edge, or side of other structures, the new construction shall include the construction of approved connections therewith using the same kind of concrete as is used in the new construction. Make the joint between the old and new material with a sawcut at the nearest existing joint.

607.03.08 Dowels, Tie Bars, and Reinforcing

Provide metal reinforcing bars and wire fabric reinforcement when and as shown. When shown, provide and place dowels with "slip sleeves" as load transfer mediums. Provide and place dowels (without "slip sleeves") as fastenings or ties between new concrete and existing underlying concrete when shown. Provide tie bars when shown. Place reinforcing dowels and tie bars in conformance to the applicable requirements in **Section 205**.

607.04 Measurement and Payment *(Not applicable to privately financed public improvement)*

607.04.01 Curbs

Curb will be measured and paid for on a lineal foot basis along the face of the curb for the actual length constructed. Curb drains will be considered incidental work for which no separate payment will be made. The bid item shall specify the material of the curb to be asphalt or cement concrete. Payment will include full compensation for all labor, materials, and equipment.

607.04.02 Combination Curb and Gutter

Combination curb and gutter will be measured and paid for on a lineal foot basis along the face of the curb for the actual length constructed. Curb drains will be considered incidental work for which no separate payment will be made. Payment will include full compensation for all labor, materials, and equipment.

607.04.03 Sidewalks and Pathways

Sidewalk shall be measured and paid for on a square yard basis for the actual square yards of sidewalk constructed.

Payment will include full compensation for all labor, materials, and equipment.

607.04.04 Concrete Valley Gutter

Concrete valley gutter will be measured and paid for on a lineal foot basis for the actual length of gutter constructed. Payment will include full compensation for all labor, materials, and equipment.

607.04.05 Median Islands

Median islands will be measured by component parts of curb and sidewalks as described above.

607.04.06 Driveways

Measurement and payment of Portland Cement or asphalt concrete driveways will be made on a square yard basis on the actual surface of the specified thickness concrete or asphalt completed and accepted. Payment will include full compensation for all labor, materials, and equipment.

607.04.07 Sawed Joints

Sawed joints will be measured and paid for on a lineal foot basis for each joint sawed, cleaned, and sealed as specified and directed by the Engineer. Payment will include full compensation for all labor, materials, and equipment. When neither specified nor shown in the Contract Documents for separate payment, it shall be considered incidental to the other items of work and no separate payment will be made.

607.04.08 Aggregate Base

Pay quantities of aggregate base material will be measured and paid for as set forth in **Section 603**. When neither specified nor shown in the Contract Documents for separate payment, it shall be considered incidental to the other items of work and no separate payment will be made.

608 Geotextile Fabrics

608.01 Description

This work consists of furnishing and placing geotextile fabrics on subgrades (subgrade geotextile) and beneath an asphalt overlay (pavement overlay geotextile) as shown on the plans or as directed by the Engineer.

608.02 Materials

Geotextile materials shall conform to **Subsection 205.02.11**.

608.03 Construction

608.03.01 General

General requirements for placement of geotextile shall be in accordance with **Subsection 205.03.01**.

608.03.02 Subgrade Geotextile

For roadbed subgrade separation, prepare the subgrade according to **Section 601**.

Correct geotextile failures, as evidenced by soil pumping or roadbed distortion, by removing any covering material in the affected area and placing a geotextile patch on the exposed geotextile. The patch shall overlap the exposed geotextile a minimum of 12-inches. Cover the patch with the specified cover material and compact before proceeding.

608.03.03 Pavement Overlay Geotextile

A. GENERAL – Place geotextile and pavement overlay in four basic steps:

(1) Surface preparation

(2) Sealant application

(3) Geotextile placement

(4) Overlay placement

B. WEATHER LIMITATIONS – Place sealant and geotextile in accordance with **Subsection 605.03.12**, except the minimum air temperature shall be 50º F for paving grade asphalt sealant placement and 60º F for asphalt emulsion sealant placement.

C. SURFACE PREPARATION – Prepare the pavement surface on which the sealant is to be placed according to specifications and the following:

(1) Clean and fill cracks exceeding 1/8-inch width with an approved asphalt crack filler.

(2) Repair minor irregularities or depressions as directed.

(3) Allow crack filling material to cure before placing geotextile.

(4) Where the pavement is severely cracked, rutted, deformed, or otherwise distressed, place a leveling course as directed by the Engineer instead of extensive surface preparation.

D. SEALANT APPLICATION – Use a normal paving grade asphalt. A cationic or anionic emulsion may be used as approved. Do not use cutbacks or emulsions that contain solvents.

Uniformly spray the asphalt sealant at normal application temperature by means of a pressure distributor on the prepared dry pavement surface. Apply at the normal rate of 0.20 to 0.30 gallon per square yard or as recommended by the geotextile manufacturer when directed by the Engineer.

If using emulsions, increase the application rate 50% or as directed by the Engineer. Some underlying surfaces may require a higher application rate. Within street intersections, on steep grades, or in other zones where vehicle speed changes are commonplace, reduce the normal application rate by 20% or as directed by the Engineer.

The target width of sealant application shall be geotextile width plus 6-inches. Apply the sealant only as far in advance of geotextile installation as appropriate to ensure a tacky surface at the time of geotextile placement. Place geotextile the same day as the sealant. Do not allow traffic on the sealant. Clean excess asphalt from the road surface.

E. GEOTEXTILE PLACEMENT – Place the geotextile into the sealant using mechanical or manual lay-down equipment capable of providing a smooth installation with a minimum amount of wrinkling or folding before the sealant loses tackiness. When asphalt emulsions are used, allow the asphalt to separate from the water (break) before placing the geotextile.

Slit wrinkles or folds exceeding 1-inch and lay flat. Shingle-lap not more than 6-inches in the direction of the paving. Broom and/or pneumatic roll to maximize geotextile contact with the pavement surface. Additional hand-placed sealant material may be required at laps as determined.

Limit traffic to necessary construction equipment and emergency vehicles on the geotextile before and during paving unless otherwise directed. Turn the paver and other vehicles gradually. Keep turning to a minimum to avoid geotextile movement and damage. Avoid abrupt starts and stops.

F. OVERLAY PLACEMENT – Place the overlay the same day the geotextile is placed. Remove sealant that bleeds through the geotextile. Do not windrow asphalt concrete

material on the geotextile ahead of the paving machines. Do not use an asphalt concrete material pickup machine. In the event of rain, the Contractor shall place sand over uncovered fabric to absorb sealant.

608.04 MEASUREMENT AND PAYMENT *(NOT APPLICABLE TO PRIVATELY FINANCED PUBLIC IMPROVEMENTS)*

Measurement and payment for the work in this section shall be in accordance with **Subsection 205.04.01**.

609 COLD PLANE PAVEMENT REMOVAL

609.01 DESCRIPTION

This work shall consist of preparing a foundation for placement of new surfacing by removal of existing surfacing to the depth, width, and cross section shown on the plans.

609.02 CONSTRUCTION

609.02.01 EQUIPMENT

The existing surfacing shall be removed with a self-propelled planning machine or grinder. The equipment shall be capable of accurately establishing profile grades within a tolerance of 0.02-foot by reference from either the existing pavement or from independent grade control and shall have a positive means for controlling cross slope elevations. The equipment shall incorporate a totally enclosed cutting drum with replaceable cutting teeth and shall have an effective means for removing excess material from the surface and for preventing dust from escaping into the air. The use of a heating device to soften the pavement will not be permitted.

When existing structures exist in the area of work, smaller equipment and handwork may be necessary to remove the material adjacent to the structures.

609.02.02 PAVEMENT REMOVAL

The existing pavement shall be removed to the depth, width, grade, and cross section shown on the plans or as directed by the Engineer to provide a surface profile true to specified grade and transverse slope.

Except where samples are taken to establish a job mix formula, the existing surfacing shall not be removed more than 5-days prior to construction of the new surfacing unless otherwise approved by the Engineer.

Wherever samples are obtained from existing surfacing more than 5-days prior to construction of the new surfacing, the Contractor shall patch the samples areas with asphalt concrete at no expense to the City.

All material to the depths specified shall be removed adjacent to existing structures and the structures shall be adjusted to grade in accordance with **Section 610** at no additional expense to the City.

609.02.03 SURFACE TOLERANCE

The new surface resulting from the pavement removal will be tested by the City for trueness to specified grade and transverse slope at selected locations. Testing will be with a 10-foot straightedge.

The variation of the surface from the testing edge of the straightedge between any 2 contact points shall not exceed 0.02-foot.

609.02.04 Disposal of Materials

Materials removed under this specification that are not recycled and used on the project shall become the property of the Contractor at the point of removal and shall be disposed of off the limits of the project in a manner satisfactory to the Engineer.

The Contractor is encouraged to salvage any removed, cold-planed materials that are not recycled and used on the project for use on future projects.

609.03 Measurement and Payment *(Not applicable to privately financed public improvements)*

Materials removed under this specification, regardless of thickness, will be measured for payment on a square yard basis. The pay quantities will be determined by measurement of the actual surface of the area from which the materials have been removed and computed to the nearest 0.1 square yard.

610 Adjustment Of Structures To Grade

610.01 Description

This section covers the work necessary for adjusting tops of structures (e.g., manholes, sumps, catch basins, inlets, valve boxes, meter boxes, monument boxes, and similar structures) to required elevation and/or horizontal alignment, complete.

610.02 Materials

Materials used in adjustment of existing structures shall be materials salvaged from the existing installation and brought to a condition approved for reuse by the Engineer. If existing materials cannot be brought to a condition approved for reuse, new materials must be supplied at no additional cost to the City.

610.03 Construction

610.03.01 General

Excavation shall be unclassified and shall include whatever materials are encountered to the depths as necessary to accomplish the work.

Except for overlay work, structures such as manholes, sumps, catch basins, inlets, and similar structures shall be adjusted to final finished grade before the final lift of paving. When these structures are affected during overlay work, adjust them according to **Standard Detail 638, Manhole Frame Adjustment**. Do not use a jackhammer for pavement cutting. For all paving work, structures such as valve boxes, monument boxes, and similar structures shall be loosened and otherwise repaired prior to final lift of paving and shall be adjusted to final finished grade during the installation of the final lift of paving.

Backfill shall be done in accordance with the applicable requirements of **Section 206**.

610.03.02 Salvage of Existing Structures

Metal frames, covers, grates, and fittings may be salvaged from structures to be adjusted or abandoned.

Salvaged components to be reused shall be cleaned of foreign material by solvents, sand blasting, or other methods that will not harm the component but will restore it to a nearly new condition. Salvaged structures not reused on the project shall become the property of the City.

610.03.03 Raising Tops of Masonry Structures

After existing frames, covers, and grates have been removed, expose the top surface on which new concrete is to be placed and chip away at least ½-inch to expose firm concrete. The new surface shall be cleaned by brushing and shall be moistened with water at the time of placing new concrete. New concrete shall then be placed to required grade and cured at least 7-days after which the frame shall be seated in fresh mortar and brought to the proper grade.

Masonry of bricks or concrete blocks shall be raised with new bricks, blocks, mortar, or combinations thereof or with Portland Cement Concrete as conditions may require. Concrete boxes may be lifted and placed on precast concrete box extensions, on new brick, or on cast-in-place concrete as may be suitable.

Mortar for building up existing masonry shall not be placed to a depth exceeding 1-inch. Concrete shall not be placed to a depth of less than 4-inches. To conform to these requirements, existing shells or walls of structures to be raised shall be cut down as necessary to provide space for the new construction.

Fabricated metal rings or plates may be furnished and used in adjustment work, provided the metal and its fabrication design is at least equal to specified characteristics of strength and support required of the covers or grates to be placed, that uniform bearing of bearing surfaces is assured, and that positive provision is afforded against displacement when in service.

610.03.04 Lowering Tops of Masonry Structures

Where the top of an existing masonry structure is to be lowered, the masonry portion of the structure shall be exposed to required depth and cut off or removed to an elevation below that established for the bottom of metal frame or cover which is to be reset on masonry, and shall then be built up with mortar, concrete, brick, or concrete blocks, or with metal rings or plates to required elevation and top design. Joining of new material to old shall be as specified in **Section 208**. The Engineer of Record shall certify that the strength and loading capacity of the structure has not been compromised or the structure shall be removed and replaced with a structure with adequate strength and loading capacity.

610.03.05 Adjusting Metal Structures

Metal inlets, valve boxes, meter boxes, monument boxes, or other like structures shall be normally raised or lowered to grade by resetting the entire structure on firm foundation. In the case of raising the structure to a point where it would not enclose or protect its contents, add metal extensions of like design below the original structure. Contractor may replace the structure with a new structure of adequate design as approved and at no expense to the City. Salvaged structures not reused on the project shall become the property of the City. Metal structures shall meet the surface smoothness requirements of **Subsection 605.03.20**. Conform to applicable Sections of **Chapters 300 and 400**.

610.04 Measurement and Payment *(Not applicable to privately financed public improvements)*

610.04.01 Adjustment of Structures to Grade

When no pay item is listed in the Contract Documents, all work will be considered as incidental to the other pay items and no separate payment will be made.

When listed in the Contract Documents, measurement will be the actual number of manholes, sumps, catch basins, inlets, valve boxes, meter boxes, monument boxes, and other like structures adjusted under this section, measured as units per each in place, completed and accepted. Separate measurement will be made of each specific type or of each separate grouping of types of structures for which separate items are shown in the Contract Documents. Required earthwork, backfill, replacement of base drains, stone bases, pavements, and other miscellaneous work will be considered as incidental to the adjusting work and no separate measurement thereof will be made.

Bid items for adjusting manholes or reconstructing concrete manholes shall refer to manholes, sumps and like structures designed to permit human entry and working space therein, and to confine and control the flow of pipe conveyed liquids – which structures are herein collectively referred to as manholes. Bid items shall be broken into two categories for manholes under the following regulations:

A. Manholes (regardless of the kind of materials of which they are composed and regardless of design, type, or depth) that have had the tops thereof adjusted as specified, and

B. Monolithic concrete manholes that, in having their tops adjusted as specified, have necessarily had their entire existing cones destroyed and new cones constructed, or had their entire existing top slabs destroyed and new slabs constructed, or precast manholes that have necessarily had adjustments made below the cone.

Bid items for adjusting inlets shall refer to inlets and catch basins, defined as structures designed to receive surface water through grates and orifices and to discharge said waters under control through pipes and is applicable to such structures regardless of their designs, types, or sizes.

Bid items for adjusting boxes shall refer to valve boxes, meter boxes, monument boxes, and other like structures that are comprised of a box like body and removable cover provided for the protection of and access to meters, valves, markers, monuments, shut offs, and similar items. If a protective coating is required on the new metal used in the work, the coating shall be provided as an incidental item without separate or additional compensation.

END OF CHAPTER