

TABLE OF CONTENTS

Section	Title	Page
SECTION 100 -- GENERAL PROVISIONS		
101	DEFINITIONS AND TERMS.....	61
101.01	Abbreviations.....	61
101.02	Above Normal Rainfall.....	63
101.03	Blank	63
101.04	Bid Bond	63
101.05	Bidder.....	63
101.06	Bridge.....	63
	(a) Length	63
	(b) Roadway Width.....	63
101.07	Calendar Day.....	64
101.08	Blank.....	64
101.09	Change Order	64
101.10	Construction Limits	64
101.11	Contract	64
101.12	Contract Information Book	64
101.13	Contract Item (Pay Item).....	64
101.14	Contract Time.....	64
101.15	Contractor.....	64
101.16	Culvert.....	64
101.17	Department	64
	(a) Materials and Tests Division	65
	(b) Contract Services Section	65
	(c) Procurement and Distribution Division.....	65
101.18	Commissioner.....	65
101.19	Engineer.....	65
101.20	Equipment	65
101.21	Extra Work	65
101.22	Force Account Work.....	65
101.22.1	Frequency Manual	65
101.23	Holidays	65
101.24	Invitation for Bids	66
101.25	Itemized Proposal.....	66
101.26	Laboratory	66
101.27	Major and Minor Contract Items	66
101.28	Materials	66
101.29	Notice to Proceed.....	66
101.30	Open to Unrestricted Traffic	66
101.31	Pavement Structure.....	66
101.32	Performance Bond.....	66
101.33	Plans	67
101.33.1	Professional Engineer.....	67
101.34	Profile Grade	67
101.35	Project	67
101.36	Proposal	67
101.37	Proposal Book.....	67
101.38	Reasonably Close Conformance.....	67
101.39	Right-of-Way	67
101.40	Road.....	67
101.41	Roadbed	67
101.42	Roadside.....	67
101.43	Roadside Development.....	68
101.44	Roadway	68
101.45	Schedule of Pay Items	68

TABLE OF CONTENTS

Section	Title	Page
101.46	Shoulder	68
101.47	Sidewalk.....	68
101.48	Special Provisions	68
101.49	Specifications.....	68
101.50	Specified Completion Date	68
101.51	State	68
101.52	Street.....	68
101.53	Structures.....	68
101.53.1	Substantial Completion.....	68
101.54	Blank.....	69
101.55	Subcontractor.....	69
101.56	Subgrade	69
101.57	Substructure.....	69
101.58	Superintendent	69
101.59	Superstructure	69
101.60	Supplemental Specifications	69
101.61	Surety	69
101.62	Technician or Inspector.....	69
101.63	Titles (Headings).....	69
101.64	Township, Town, City	69
101.65	Traveled Way	69
101.66	Work.....	69
101.67	Work Day	69
101.68	Working Drawings	70
102	BIDDING REQUIREMENTS AND CONDITIONS	70
102.01	Prequalification and Bidding	70
102.02	Certification Regarding Lobbying for Contracts, Grants, Loans, and Cooperative Agreements.....	70
103	AWARD AND EXECUTION OF CONTRACT	70
103.01	Disadvantaged Business Enterprise Program.....	70
	(a) General Requirements	70
	(b) Definitions	71
	1. DBE71	71
	2. Small Business Concern	71
	3. Socially and Economically Disadvantaged Individuals	71
	4. Certified DBE	71
	(c) Goal	71
	1. DBE Joint Venture Type A	72
	2. DBE Joint Venture Type B.....	72
	(d) Affirmative Actions	73
	(e) Guidelines for Determining Good Faith Efforts.....	73
	(f) Affirmative Action Certification.....	75
	(g) Subcontracts.....	75
	(h) Leases and Rentals.....	76
	(i) Records and Reports	76
103.02	Specific Equal Employment Opportunity Responsibilities	77
103.03	Blank.....	77
103.04	Insurance	77
	(a) Worker's Compensation and Employer's Liability.....	78
	(b) Commercial General Liability	78
	(c) Business Automobile Liability.....	78
	(d) Railroad's Protective Liability	78
	(e) Owner's and Contractor's Protective Liability Insurance Coverage for Operations of Designated Contractor	78
	(f) Basis of Payment	79

TABLE OF CONTENTS

Section	Title	Page
103.05	Waiver of Damages	79
103.06	Wage and Labor Requirements	80
	(a) Nondiscrimination of Employees	80
	(b) Affidavits and Payrolls	80
	(c) Wage Stipulations.....	80
	1. General Decision Included in Contract Information Book	81
	2. General Decision Not Included in Contract Information Book.....	81
103.07	Accident Prevention and Safety.....	81
104	SCOPE OF WORK	81
104.01	Intent of Contract.....	81
104.02	Differing Site Conditions, Suspension of Work and Significant Changes in the Character of Work	82
	(a) Differing Site Conditions.....	82
	(b) Suspensions of Work Ordered by the Engineer	82
	(c) Significant Changes in the Character of Work	83
	(d) Pre-established Remedies to Changed Conditions.....	84
104.03	Extra Work	84
104.04	Maintenance of Traffic	84
	(a) Special Detours.....	85
	(b) Maintenance Directed by the Engineer.....	85
	(c) Blank	85
	(d) Traffic Control for Patching on a Two-Lane Roadway.....	85
104.05	Removal and Disposal of Structures and Obstructions	86
104.06	Removal and Disposal of Regulated Materials.....	86
	(a) For Such Materials which are Identified in the Proposal Book as Being Present on the Project Site	87
	(b) For Such Materials which are not Identified in the Proposal Book as Being Present on the Project Site	87
104.07	Rights in and Use of Materials Found in the Project Site.....	89
104.08	Final Clean-Up.....	90
105	CONTROL OF WORK	90
105.01	Authority of the Engineer.....	90
105.02	Plans and Working Drawings	91
105.03	Conformance with Plans and Specifications.....	91
105.04	Coordination of Plans, Standard Specifications, Supplemental Specifications, and Special Provisions	92
105.05	Cooperation by Contractor.....	93
105.06	Cooperation with Utilities.....	93
105.07	Cooperation Between Contractors.....	94
105.08	Construction Stakes, Lines, and Grades.....	94
	(a) Construction Engineering by the State.....	94
	(b) Construction Engineering by the Contractor	95
	(c) Production Staking by the Contractor.....	97
105.09	Duties of Technician and Inspector	97
105.10	Inspection of Work	98
105.11	Removal of Unacceptable and Unauthorized Work.....	99
105.12	Load Restrictions	99
105.13	Maintenance During Construction	99
105.14	Failure to Maintain Roadway, Structures, Barricades, and Construction Signs	100
105.15	Acceptance and Final Inspection	100
	(a) Partial Acceptance.....	100
	(b) Final Acceptance	100
105.16	Claims for Adjustment and Disputes.....	100
105.17	Field Office.....	101
105.18	Method of Measurement	106
105.19	Basis of Payment	106

TABLE OF CONTENTS

Section	Title	Page
106	CONTROL OF MATERIAL	107
106.01	Source of Supply and Quality Requirements	107
	(a) Approved or Prequalified Materials.....	107
	(b) Material Records.....	108
	1. Documentation of Material Delivery.....	108
	2. Delivery Ticket Information	108
	3. Payment Procedures.....	108
	(c) Buy American Requirement	108
106.02	Samples, Tests, Cited Specifications.....	109
106.03	Plant Inspection	109
106.04	Field Laboratory	110
106.05	Storage of Materials.....	110
106.06	Handling Materials	110
106.07	Unacceptable Materials.....	110
106.08	Hazard Communication Program	110
106.09	Department Furnished Materials	111
106.10	Proportioning Materials	111
106.11	Sample Asbestos Exclusion Letter.....	111
107	LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC.....	111
107.01	Laws to be Observed.....	111
107.02	Permits, Licenses, and Taxes	113
107.03	Patented Devices, Materials, and Processes.....	113
107.04	Restoration of Surfaces Opened by Permit	113
107.05	Federal Aid Provisions	113
107.06	Equal Employment Opportunity Trainees	114
107.07	Sanitary Conditions Requirements	116
107.08	Public Convenience and Safety	116
	(a) Employee Safety	116
	(b) Dust and Air Pollution.....	116
	(c) Protection to Traffic.....	116
	(d) Notice to Local Public Officials	116
	(e) Convenience to Traffic and Property Owners	117
107.09	Railroad-Highway Requirements	117
	(a) Protection of Track Ballast.....	118
	(b) Hold Harmless Clause.....	118
107.10	Blank.....	118
107.11	Bridges over Navigable Waters	118
107.12	Traffic Control Devices	119
107.13	Use of Explosives.....	120
107.14	Protection and Restoration of Property and Landscape.....	121
107.14.1	Erosion Control Plan and Proof of Publication	121
107.15	Forest Protection.....	122
107.16	Responsibility for Damage Claims	122
107.17	Opening Sections of Project to Traffic.....	123
107.18	Contractor's Responsibility for Work.....	124
107.19	Contractor's Responsibility for Utility Property and Services	124
107.20	Furnishing Right-of-Way.....	125
107.21	Personal Liability of Public Officials	125
107.22	Waiver of Legal Rights.....	125
107.23	Governing Law	125
107.24	Severability	125
108	PROSECUTION AND PROGRESS	126
108.01	Subletting of Contract.....	126
108.02	Notice to Proceed.....	126

TABLE OF CONTENTS

Section	Title	Page
108.03	Prosecution of the Work.....	126
108.04	Prephase Site Construction Meetings.....	130
108.05	Limitation of Operations.....	130
108.06	Character of Workers, Methods, and Equipment.....	130
108.07	Determination and Extension of Contract Time.....	131
108.08	Failure to Complete on Time.....	135
108.09	Default and Termination of Contract.....	136
108.10	Termination of Contractor's Responsibility.....	137
108.11	Contract Documentation.....	138
109	MEASUREMENT AND PAYMENT.....	138
109.01	Measurement of Quantities.....	138
	(a) General Requirements.....	138
	(b) Scales and Measurement by Mass (Weight).....	139
	(c) Measurement by Volume.....	141
	(d) Measurement of Asphalt Materials.....	141
	(e) Measurement of Portland Cement Concrete.....	142
	(f) Measurement of Aggregates.....	142
	(g) Measurement of Timber or Lumber.....	143
	(h) Rental of Equipment.....	143
	(i) Manufactured Materials.....	143
109.02	Scope of Payment.....	143
109.03	Compensation for Altered Quantities.....	144
109.04	Cost Reduction Incentive.....	144
	(a) Cost Reduction Incentive Proposal Requirements.....	145
	(b) Approval of Proposal.....	146
	(c) Method of Measurement.....	147
	(d) Basis of Payment.....	147
109.05	Extra Work and Force Account Work.....	148
	(a) Labor Costs.....	148
	(b) Bond and Insurance.....	148
	(c) Materials.....	148
	(d) Equipment.....	148
	(e) Miscellaneous.....	148
	(f) Subcontracting.....	149
	(g) Compensation.....	149
	(h) Statements.....	149
	(i) Cost Breakdown.....	149
109.06	Eliminated Pay Items.....	149
109.07	Partial Payments.....	150
109.08	Final Payment.....	151
110	MOBILIZATION AND DEMOBILIZATION.....	151
110.01	Description.....	151
110.02	Limitations.....	151
110.03	Method of Measurement.....	152
110.04	Basis of Payment.....	152
111	STOCKPILED MATERIALS.....	152
111.01	Decription.....	152
111.02	General Requirements.....	152
111.03	Structural Steel and Concrete Structural Members.....	152
	(a) Delivered to the Job Site.....	152
	(b) Acceptably Stored at the Fabricator's or Manufacturer's Storage Facilities.....	152
111.04	Dowel Bar Assemblies.....	153
111.05	Granular Base, Subbase Materials, and Aggregates for HMA and Concrete Pavements.....	153

TABLE OF CONTENTS

Section	Title	Page
111.06	Bridge Expansion Joints	153
	(a) Type SS	153
	(b) Type M	153
111.07	Structural Supports for Signals, Signs and Luminaries	153
111.08	Precast Concrete Median Barrier	154
111.09	Additional Requirements	154
111.10	Method of Measurement	154
111.11	Basis of Payment	154

SECTION 200 -- EARTHWORK

201	CLEARING AND GRUBBING	156
201.01	Description	156
201.02	General	156
201.03	Clearing and Grubbing	156
201.04	Scalping	157
201.05	Hedge Removal	157
201.06	Method of Measurement	157
	(a) Area Basis	157
	(b) Lump Sum Basis	157
	(c) Linear Basis	157
	(d) Individual Unit Basis	157
201.07	Basis of Payment	158
	(a) Area Basis	158
	(b) Lump Sum Basis	158
	(c) Linear Basis	158
	(d) Individual Unit Basis	158
	(e) Clearing Right-of-Way	159
	(f) Exclusions	159
202	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	159
202.01	Description	159
202.02	General Requirements	159
	(a) Type X Waste	160
	(b) Type Y Waste	160
	(c) Type Z Waste	160
202.03	Removal of Bridges, Culverts, and Other Drainage Structures	160
	(a) Complete	161
	(b) Portions	161
	(c) Disposal of Concrete	162
202.04	Removal of Pipe and Tile Drains	162
202.05	Removal of Pavement, Sidewalks, Curbs, Surface, Surface Milling, etc.	163
202.06	Removal of Houses and Buildings	164
202.06.1	Inspection and Removal of Asbestos	165
202.07	Removal of Underground Storage Tanks Containing Petroleum Products or Other Hazardous Chemicals	165
	(a) Type A Waste	168
	(b) Type B Waste	168
	(c) Type C Waste	168
202.08	Remediation of Contaminated Soil and Groundwater	168
202.09	Remediation of Other Regulated Materials	169
202.10	Transportation and Disposal of Regulated Materials	169
202.11	Blank	169
202.12	Method of Measurement	169
202.13	Basis of Payment	170

TABLE OF CONTENTS

Section	Title	Page
203	EXCAVATION AND EMBANKMENT.....	175
203.01	Description.....	175
203.02	Common Excavation.....	175
203.03	Rock Excavation.....	175
203.04	Unclassified Excavation.....	176
203.05	Peat Excavation.....	176
203.06	Waterway Excavation.....	176
203.07	Class Y Excavation.....	176
203.08	Borrow or Disposal.....	176
203.09	General Requirements	178
203.10	Disposal of Excavated Material (Except Waterway and Peat Excavation)	180
203.11	Disposal of Waterway Excavation.....	180
203.12	Disposal of Peat.....	181
203.13	Slides.....	181
203.14	Drainage.....	181
203.15	Excavating Rock.....	182
203.16	Peat Deposit Treatment.....	184
	(a) Treatment of Existing Fills.....	185
	(b) Treatment by Removal	185
	(c) Treatment by Displacement.....	185
203.17	Cased Test Holes	186
203.18	Embankment Construction.....	187
203.19	Embankment Over and Around Structures	187
203.20	Rock and Shale Embankment	187
	(a) Rock Embankment	187
	(b) Shale, Shale and Soft Rock Mixtures, or Soft Rock	188
	(c) Shale and Thinly Layered Limestone	189
203.21	Embankment on Hillsides or Slopes	189
203.22	Embankment Over Existing Roadbeds	190
203.23	Embankment Other Than Rock and Shale, With Density Control	191
203.24	Method of Making Density Tests.....	192
	(a) Laboratory	192
	(b) Field.....	192
203.25	Embankment Without Density Control.....	192
203.26	Proofrolling	193
203.27	Method of Measurement	193
	(a) Contract Quantity	193
	(b) Measured Quantities	193
	(c) Measurement on a Linear Basis	194
	(d) Measurement of Excavation Items on a Weight Basis	194
	(e) Measurement of Embankments	194
	(f) Measurement of Borrow	195
	(g) Measurement of Subgrade Treatment.....	195
	(h) Measurement of Water for Shale, Shale and Soft Rock Mixtures, or Soft Rock	195
	(i) Lump Sum	195
	(j) Measurement of Exploratory Cores.....	195
203.28	Basis of Payment	195
204	GEOTECHNICAL INSTRUMENTATION	198
204.01	Description.....	198
204.02	Materials	198
204.03	Settlement Plates.....	198
	(a) Installation of Settlement Plates	198
	(b) Instrument Readings and Settlement Period	199
204.04	Method of Measurement	200

TABLE OF CONTENTS

Section	Title	Page
204.05	Basis of Payment	200
205	TEMPORARY EROSION AND SEDIMENT CONTROL	200
205.01	Description.....	200
205.02	Materials	200
205.03	Temporary Perimeter Protection	201
	(a) Straw Bales.....	201
	(b) Silt Fence.....	201
205.04	Temporary Slope Protection.....	202
205.05	Sediment Control in Side Ditches	202
205.06	Sediment Basin.....	203
205.06.1	Fish Pool and Sediment Trap.....	203
205.07	Temporary Inlet Protection	203
205.08	Maintenance of Erosion and Sediment Control Measures	203
205.09	Removal of Temporary Erosion and Sediment Control Measures	203
205.10	Method of Measurement	203
205.11	Basis of Payment	204
206	STRUCTURE EXCAVATION	205
206.01	Description.....	205
206.02	Class X Excavation.....	206
	(a) General Excavation.....	206
	(b) Excavation for Foundations of Traffic Support Structures.....	206
206.03	Wet Excavation	207
206.04	Dry Excavation	207
206.05	Foundation Excavation, Unclassified.....	207
206.06	General Requirements	207
206.07	Disposal of Excavated Material.....	208
206.08	Preparation of Foundation Surfaces.....	208
206.09	Cofferdams and Temporary Construction Dikes	209
206.10	Method of Measurement	210
206.11	Basis of Payment	210
	(a) Culverts and Retaining Walls.....	212
	(b) Bridges.....	213
	(c) Traffic Structure Supports.....	214
207	SUBGRADE	214
207.01	Description.....	214
207.02	General Requirements	214
207.03	Subgrade for HMA Base Courses	215
207.04	Subgrade for Approaches	216
207.05	Subgrade for Cement Concrete Base and Pavement	216
207.06	Special Subgrade Treatment.....	216
207.07	Method of Measurement	217
207.08	Basis of Payment	217
208	FINISHING SHOULDERS, DITCHES, AND SLOPES.....	217
208.01	Description.....	217
208.02	Finishing Shoulders	218
208.03	Finishing Ditches	218
208.04	Finishing Slopes	218
208.05	Blank.....	218
208.06	Finishing at Contract Drainage Structures	218
208.07	Method of Measurement	219
208.08	Basis of Payment	219
209	FINISHING EARTH GRADED ROADS.....	219
209.01	Description.....	219

TABLE OF CONTENTS

Section	Title	Page
209.02	Construction Requirements	219
209.03	Method of Measurement	219
209.04	Basis of Payment	219
210	FINAL TRIMMING AND CLEANING	219
210.01	Description.....	219
210.02	Construction Requirements	219
210.03	Method of Measurement	220
210.04	Basis of Payment	220
211	B BORROW FILL AND BACKFILL	220
211.01	Description.....	220
211.02	Materials	221
	(a) Gradation for Structure Backfill.....	221
	(b) Gradations for Other Types of Backfill.....	221
	(c) Flowable Mortar Substitution.....	221
211.03	General Requirements	222
211.04	Mechanical Compaction	222
211.05	Blank.....	222
211.06	Embankment for Bridges.....	222
211.07	B Borrow Around Bents.....	223
211.08	Spandrel Filling.....	223
211.09	Method of Measurement	223
211.10	Basis of Payment	224
212	STOCKPILED SELECTED MATERIALS	224
212.01	Description.....	224
212.02	Materials	225
212.03	Construction Requirements	225
212.04	Method of Measurement	225
212.05	Basis of Payment	225
213	FLOWABLE MORTAR	226
213.01	Description.....	226
213.02	Materials	226
213.03	Proportioning.....	226
213.04	Mix.....	226
	(a) Flow	226
	(b) Average Penetration Resistance.....	227
	(c) Mixing Equipment.....	227
	(d) Placement	227
	(e) Limitation of Operations	227
213.05	Blank.....	227
213.06	Method of Measurement	227
213.07	Basis of Payment	227
214	DETENTION PONDS	228
214.01	Description.....	228
214.02	Materials	228
214.03	Construction Requirements	228
214.04	Method of Measurement	228
214.05	Basis of Payment	228

SECTION 300 -- BASES

301	Blank.....	230
302	Blank.....	230

TABLE OF CONTENTS

Section	Title	Page
303	COMPACTED AGGREGATE BASE, SURFACE, OR SHOULDERS.....	230
303.01	Description.....	230
	(a) Type O Mix.....	230
	(b) Type P Mix.....	230
303.02	Materials.....	230
303.03	Preparation of Type P Mixture.....	230
	(a) Mixer Unit.....	230
	(b) Conveyors and Feeders.....	231
	(c) Water Pump and Meter.....	231
	(d) Mixing.....	231
303.04	Calcium Chloride.....	231
303.05	Preparation of Subgrade or Subbase.....	231
303.06	Handling and Transporting Mixtures.....	231
303.07	Spreading Mixtures.....	232
303.08	Control of Width.....	232
303.09	Compacting Aggregate.....	232
303.10	Checking and Correcting Surface.....	232
303.11	Temperature Limitations.....	233
303.12	Priming Compacted Aggregate Base.....	233
303.13	Blank.....	233
303.14	Protection of Surface.....	233
303.15	Method of Measurement.....	233
303.16	Basis of Payment.....	233
304	SUBBASE.....	234
304.01	Description.....	234
304.02	Materials.....	234
304.03	Subgrade Preparation.....	234
304.04	Spreading.....	234
304.05	Compacting.....	234
304.06	Surface Requirements.....	235
304.07	Method of Measurement.....	235
304.08	Basis of Payment.....	235
305	RECONDITIONING.....	236
305.01	Description.....	236
305.02	Materials.....	236
305.03	Repairing.....	236
305.04	Blank.....	237
305.05	Patching Asphalt Pavement.....	237
305.06	Patching Rigid Pavement or Rigid Base.....	238
	(a) Patching with Portland Cement Concrete.....	238
	(b) Patching with HMA Mixture.....	239
305.07	Blank.....	239
305.08	Sealing Cracks and Joints in Asphalt Pavement.....	239
305.09	Filling Cracks and Joints in Concrete Pavement.....	239
305.10	Widening.....	239
	(a) Widening with HMA Mixture.....	239
	(b) Widening with Cement Concrete.....	240
	(c) Widening with Compacted Aggregate.....	241
305.11	Method of Measurement.....	241
305.12	Basis of Payment.....	241
306	Blank.....	242
307	PORTLAND CEMENT CONCRETE BASE.....	242
307.01	Description.....	242

TABLE OF CONTENTS

Section	Title	Page
307.02	Materials	242
307.03	General Requirements	242
307.04	Joints	243
307.05	Placing Steel	243
307.06	Final Finish	243
307.07	Curing	243
307.08	Monolithic Curb	243
307.09	Method of Measurement	244
307.10	Basis of Payment	244
308	Blank.....	244
309	Blank.....	244
310	CEMENT CONCRETE PAVEMENT PATCHING.....	244
310.01	Description.....	244
310.02	Materials	245
310.03	Proportioning	245
310.04	Concrete Removal.....	246
	(a) Partial Depth Removal.....	246
	(b) Full Depth Removal.....	246
310.05	Cleaning.....	247
310.06	Patching	247
	(a) Partial Depth Patching.....	248
	(b) Full Depth Patching.....	248
310.07	Method of Measurement	249
310.08	Basis of Payment	249

SECTION 400 -- ASPHALT PAVEMENTS

401	QUALITY CONTROL/QUALITY ASSURANCE, QC/QA, HOT MIX ASPHALT, HMA, PAVEMENT	250
401.01	Description.....	250
401.02	Quality Control	250
401.03	Materials	250
401.04	Design Mix Formula.....	250
401.05	Volumetric Mix Design	250
	(a) Gradation Table for Design ESAL Equal To or Greater Than 10,000,000.....	251
	(b) Gradation Table for Design ESAL Less Than 10,000,000	252
401.06	Recycled Materials	254
401.07	Lots and Sublots	254
401.08	Job Mix Formula	254
401.09	Acceptance of Mixtures	254
401.10	General	256
401.11	Preparation of Surfaces to be Overlaid	257
401.12	Process Control	257
401.13	Weather Limitations	257
401.14	Spreading and Finishing.....	257
401.15	Joints	258
401.16	Density	258
	(a) Mainline ESAL Equal To or Greater Than 10,000,000	259
	(b) Mainline ESAL Equal To or Greater Than 1,000,000 and Less Than 10,000,000	259
	(c) Mainline ESAL Less Than 1,000,000	260
401.17	Shoulder Corrugations.....	260
	(a) Formed Corrugations	260
	(b) Milled Corrugations.....	260

TABLE OF CONTENTS

Section	Title	Page
401.18	Pavement Smoothness	260
401.19	Adjustment Points	262
	(a) Mixture	262
	(b) Density.....	264
	1. Mainline ESAL Equal To or Greater Than 10,000,000	264
	2. Mainline ESAL Equal To or Greater Than 1,000,000 and Less Than 10,000,000.....	264
	(c) Smoothness.....	265
401.20	Appeals	266
	(a) Mixture	266
	(b) Density.....	266
	1. Mainline ESAL Equal To or Greater Than 10,000,000	266
	2. Mainline ESAL Equal To or Greater Than 1,000,000 and Less Than 10,000,000.....	266
401.21	Method of Measurement	267
401.22	Basis of Payment	267
402	HOT MIX ASPHALT, HMA, PAVEMENT.....	268
402.01	Description.....	268
402.02	Materials	269
402.03	Job Mix Formula	269
402.04	Mix Criteria.....	269
	(a) Composition Limits for Base Mixtures	270
	(b) Composition Limits for Intermediate Mixtures	271
	(c) Composition Limits for Surface Mixtures.....	272
	(d) Composition Limits for HMA Rumble Strip Mixtures	272
	(e) Composition Limits for HMA Wedge and Leveling Mixtures.....	272
402.05	Recycled Materials	272
402.06	Acceptance of Mixtures	273
402.07	Preparation of Mixtures	273
402.08	General	274
402.09	Preparation of Surfaces to be Overlaid	274
402.10	Weather Limitations	275
402.11	Spreading and Finishing.....	275
402.12	Joints	276
402.13	Compaction.....	276
402.14	Low Temperature Density Requirements	278
402.15	Shoulder Corrugations	279
	(a) Formed Corrugations	279
	(b) Milled Corrugations.....	279
402.16	Pavement Smoothness	279
402.17	Method of Measurement	279
402.18	Basis of Payment	280
403	COLD MIX ASPHALT, CMA, PAVEMENT.....	281
403.01	Description.....	281
403.02	Materials	281
403.03	Weather Limitations	281
403.04	Equipment	282
403.05	Preparation of Mixtures	282
403.06	Preparation of Subgrade or Base.....	282
403.07	Spreading Mixture.....	283
403.08	Curing	283
403.09	Compaction.....	283
403.10	Surface Tolerances	283
403.11	Method of Measurement	283
403.12	Basis of Payment	283
404	SEAL COAT	283

TABLE OF CONTENTS

Section	Title	Page
404.01	Description.....	283
404.02	Asphalt Material	283
404.03	Cover Aggregate.....	284
404.04	Weather Limitations	285
404.05	Equipment	285
404.06	Preparation of Surface	285
404.07	Applying Asphalt Material.....	285
404.08	Application of Cover Aggregate.....	285
404.09	Method of Measurement	286
404.10	Basis of Payment	286
405	PRIME COAT	286
405.01	Description.....	286
405.02	Asphalt Material	286
405.03	Cover Aggregate.....	287
405.04	Weather Limitations	287
405.05	Equipment	287
405.06	Preparation of Surface	287
405.07	Application of Asphalt Material	287
405.08	Cover Aggregate.....	287
405.09	Method of Measurement	287
405.10	Basis of Payment	287
406	TACK COAT	288
406.01	Description.....	288
406.02	Asphalt Material	288
406.03	Equipment	288
406.04	Preparation of Surface	288
406.05	Application of Asphalt Material	288
406.06	Method of Measurement	288
406.07	Basis of Payment	288
407	DUST PALATIVE.....	289
407.01	Description.....	289
407.02	Asphalt Material	289
407.03	Weather Limitations	289
407.04	Equipment	289
407.05	Preparation of Surface	289
407.06	Application of Asphalt Material	289
407.07	Method of Measurement	289
407.08	Basis of Payment	289
408	EQUIPMENT.....	290
408.01	Production, Transportation, and Laydown of Asphalt Mixtures.....	290
408.02	Mixing Plant.....	290
	(a) HMA Mixing Plant.....	290
	1. Plant Inspection.....	290
	2. Proportioning Systems	290
	3. Material Storage.....	290
	a. Aggregates.....	290
	b. Asphalt.....	290
	4. Aggregate Feed System.....	290
	5. Drier Unit.....	290
	6. Dust Collector	291
	7. Mixing Unit.....	291
	8. Mix Load-out Scales.....	291
	9. Hot Surge Bins.....	291

TABLE OF CONTENTS

Section	Title	Page
	10. Sampling Point Requirements.....	291
	(b) CMA Mixing Plant.....	291
408.03	HMA Laydown Operations.....	291
	(a) Distributor.....	292
	(b) Hauling Equipment.....	292
	(c) Laydown Equipment.....	292
	1. Paver.....	292
	2. Widener.....	292
	3. Other Mechanical Devices.....	292
	(d) Compaction Equipment.....	292
	1. Tandem Roller.....	293
	2. Three Wheel Roller.....	293
	3. Pneumatic Tire Roller.....	293
	4. Vibratory Roller.....	293
	5. Trench Roller.....	293
	6. Specialty Roller/Compactor.....	293
	(e) Miscellaneous Equipment.....	293
	1. Aggregate Spreader.....	293
	2. Rotary Power Broom.....	293
	(f) Smoothness Equipment.....	293
	1. Profilograph.....	293
	2. Straightedge - 4.9 m (16 ft).....	294
	3. Straightedge - 3 m (10 ft).....	294
409	Blank.....	294
410	Blank.....	294

SECTION 500 -- RIGID PAVEMENT

501	PORTLAND CEMENT CONCRETE PAVEMENT.....	295
501.01	Description.....	295
501.02	Materials.....	295
501.03	Proportioning.....	295
	(a) Composition of Concrete.....	295
	1. Blank.....	296
	2. Exceptions to AASHTO T 23 Making and Curing Concrete Specimens in the Field.....	297
	3. Exceptions to AASHTO T 97 for Flexural Test.....	298
	4. Exceptions to AASHTO T 121 for Determining the Relative Yield.....	298
	(b) Methods of Entraining Air.....	298
	(c) High Early Strength Pavement.....	299
501.04	Equipment.....	299
	(a) Batching Plant and Equipment.....	299
	1. General.....	299
	2. Bins and Hoppers.....	300
	3. Scales.....	300
	4. Automatic Weighing Device.....	300
	(b) Mixers.....	300
	1. Truck Mixers and Truck Agitators.....	300
	2. Non-Agitator Trucks.....	300
	(c) Finishing Equipment.....	301
	1. Finishing Machine.....	301
	2. Vibrators.....	301
	(d) Concrete Saw.....	301
	(e) Forms.....	301
501.05	Preparation of Grade.....	302

TABLE OF CONTENTS

Section	Title	Page
501.06	Setting Forms.....	302
	(a) Base Support.....	302
	(b) Form Setting.....	302
	(c) Grade and Alignment.....	302
501.07	Conditioning of Subgrade or Base Course.....	302
501.08	Handling, Measuring, and Batching Materials.....	303
501.09	Mixing Concrete.....	304
501.10	Limitations of Mixing.....	305
501.11	Placing Concrete.....	305
501.12	Test Specimens.....	307
501.13	Strike-off of Concrete and Placement of Reinforcement.....	307
501.14	Joints.....	307
	(a) General Requirements.....	307
	(b) Sawed Longitudinal Joints.....	308
	(c) Expansion Joints.....	308
	(d) Sawed Contraction Joints.....	309
	(e) Transverse Sawed Construction Joints.....	310
	(f) Dowel Bars and Assemblies.....	310
	(g) Retrofitted Tie-Bars for Pavement Joints.....	312
	(h) Terminal Joints.....	312
501.15	Final Strike-Off, Consolidation, and Finishing.....	312
	(a) Consolidation and Strike-Off.....	312
	(b) Floating.....	313
	(c) Checking and Surface Correction.....	314
	(d) Final Finishing.....	314
	1. Method 1-Brooming.....	314
	2. Method 2-Tining.....	315
	(e) Edging at Forms and Joints.....	315
501.16	Pavement Smoothness.....	316
501.17	Curing.....	317
	(a) Double Burlap.....	318
	(b) Straw.....	318
	(c) Waterproof Blankets.....	318
	(d) Ponding.....	319
	(e) White Membrane.....	319
	(f) Curing in Cities and Towns.....	320
501.18	Removing Forms.....	320
501.19	Sealing Cracks and Joints.....	320
501.20	Inspection for Pavement Cracking.....	321
501.21	Protection of Pavement.....	321
501.22	Opening to Traffic.....	321
501.23	Concrete Pavement, Slip-Form Method.....	321
	(a) General Requirements.....	321
	(b) Grade.....	322
	(c) Placing Concrete.....	322
	(d) Finishing.....	322
	(e) Curing.....	322
	(f) Joints.....	323
	(g) Protection Against Rain.....	323
501.24	Tolerance In Pavement Thickness.....	323
	(a) General Requirements.....	323
	(b) Taking Cores.....	323
	(c) Measuring the Cores.....	324
	(d) Determination of Average Thickness.....	324
	(e) Pavement Removal and Replacement for Core Thickness Deficiency of Greater than 25 mm (1.0 in.).....	324

TABLE OF CONTENTS

Section	Title	Page
	(f) Reinforcing Steel Requirements for Reinforced Concrete Pavement.....	324
	(g) Measuring the Reinforcing Steel Placement in Concrete Pavement	325
	(h) Removal Limits for Deficiency in Steel Placement	325
501.25	Method of Measurement	325
501.26	Basis of Payment	326
	(a) Adjusted Payment for Deficient Pavement Thickness	326
	(b) Reduced Payment for Deficient Reinforcing Steel Placement in Concrete Pavement.....	326
	(c) Non-payment or Removal of Pavement for Core Thickness Deficiencies of more than 13 mm (0.5 in.) to 25 mm (1.0 in.).....	328
502	QUALITY ASSURANCE FOR PORTLAND CEMENT CONCRETE PAVEMENT.....	329
502.01	Description.....	329
502.02	Quality Control Plan	329
	(a) General Requirements	329
	(b) Origin and Sampling of Materials	330
	(c) Trial Batch Demonstration	330
	(d) Concrete Batching and Hauling.....	330
	(e) Concrete Placement	330
	(f) Concrete Finishing, Texturing, and Curing.....	331
	(g) Production Testing	331
502.03	Materials	331
502.04	Concrete Mixture and Mix Design.....	331
502.05	Production Control and Acceptance Testing	333
502.06	Facilities and Equipment for Production Control and Acceptance Testing.....	334
502.07	Test Methods and Procedures	334
	(a) Exceptions to AASHTO T 141.....	335
	(b) Exceptions to AASHTO T 23	335
	(c) Exceptions to AASHTO T 97	335
	(d) Exceptions to AASHTO T 121.....	336
	(e) Exceptions to AASHTO T 152.....	336
502.08	Trial Batch Demonstration.....	336
502.09	Lots and Sublots, and Selection of Test Locations	337
502.10	Equipment	338
502.11	Preparation of Grade.....	338
502.12	Setting Forms.....	338
502.13	Conditioning of Subgrade or Base Course	338
502.14	Handling, Measuring, and Batching Materials.....	338
502.15	Mixing Concrete.....	338
502.16	Natural Light and Weather Limitations	338
502.17	Placing Concrete.....	338
502.18	Test Specimens.....	338
502.19	Placement of Reinforcement and Strike-off of Concrete.....	338
502.20	Joints	338
502.21	Final Consolidation, Strike-Off, and Finishing	339
502.22	Curing	339
502.23	Removing Forms	339
502.24	Sealing Cracks and Joints	339
502.26	Protection of Pavement.....	339
502.27	Opening to Traffic.....	339
502.28	Concrete Pavement, Slip-Form Method	339
502.29	Substandard Work Produced During Concrete Paving Operations.....	339
502.30	Acceptance Testing and Approval of Concrete Pavement Properties.....	339
	(a) Plastic Unit Weight Acceptance Test	340
	(b) Water/Cementitious Ratio Acceptance Determination	340
	(c) Flexural Strength Acceptance Test	340
	(d) Air Content Acceptance Test.....	340

TABLE OF CONTENTS

Section	Title	Page
502.31	Pavement Smoothness and Surface Tolerances	341
502.32	Tolerance in Pavement Thickness	341
502.33	Appeal Procedure for Air Content and Flexural Strength Acceptance Test Results	341
	(a) Pavement Cores	342
	(b) Air Content Appeal	342
	(c) Flexural Strength Appeal	343
502.34	Method of Measurement	343
502.35	Basis of Payment	344
	(a) Payment for Other Pavement Components	344
	(b) Price Adjustment for Flexural Strength and Air Content	344
	1. Flexural Strength Price Adjustment	345
	2. Air Content Price Adjustment	345
	(c) Smoothness Price Adjustment	346
	(d) Pavement Thickness and Reinforcing Steel Price Adjustment	346

SECTION 600 -- INCIDENTAL CONSTRUCTION

601	GUARDRAIL.....	347
601.01	Description.....	347
601.02	Materials	347
601.03	General Requirements	347
601.04	Guardrail Erection.....	348
601.05	Curved W-Beam Guardrail Systems	348
601.06	Guardrail Transitions	348
601.07	Guardrail End Treatments	349
601.08	Extension of Existing Guardrail.....	349
601.09	Removal of Existing Guardrail.....	349
601.10	Adjusting Existing Guardrail Height.....	349
601.11	Resetting Guardrail.....	349
601.12	Method of Measurement	350
601.13	Basis of Payment	350
602	CONCRETE BARRIER	351
602.01	Description.....	351
602.02	Materials	351
602.03	Concrete Barrier and Concrete Glare Screen.....	351
	(a) Precast Concrete Barrier and Concrete Glare Screen	351
	(b) Cast-in-Place Concrete Barrier and Concrete Glare Screen	352
	(c) Finishing.....	352
	(d) Sealing	352
	(e) Joints	352
	(f) Reflectorization.....	352
602.04	Temporary Concrete Barrier	352
	(a) Placement	352
	(b) Connection.....	353
	(c) Anchorage.....	353
	(d) Delineation.....	353
602.05	Method of Measurement	354
602.06	Basis of Payment	354
603	FENCES	354
603.01	Description.....	354
603.02	Materials	355
603.03	General Requirements	355
603.04	Setting Posts	355
603.05	Placing Barbed and Tension Wire and Fabric.....	356

TABLE OF CONTENTS

Section	Title	Page
603.06	Resetting Fence	357
603.07	Method of Measurement	357
603.08	Basis of Payment	357
604	SIDEWALKS, CURB RAMPS AND STEPS	358
604.01	Description.....	358
604.02	Materials	358
604.03	Portland Cement Concrete Sidewalks and Curb Ramps	358
	(a) General Requirements	358
	(b) Excavation	358
	(c) Forms	358
	(d) Placing Concrete.....	359
	(e) Finishing.....	359
	(f) Joints.....	359
	(g) Curing	359
604.04	Portland Cement Concrete Steps	359
604.05	Reconstructed Portland Cement Concrete Sidewalk.....	359
604.06	Re-Laid Portland Cement Concrete Sidewalk.....	360
604.07	HMA Sidewalk	360
	(a) Excavation and Forms	360
	(b) Bed Course.....	360
	(c) Placing HMA Sidewalk.....	360
604.08	Backfilling and Finishing Shoulders and Slopes	360
604.09	Method of Measurement	360
604.10	Basis of Payment	361
605	CURBING	362
605.01	Description.....	362
605.02	Materials	362
605.03	Precast Cement Concrete Curbing	362
	(a) Excavation	362
	(b) Installation	362
	(c) Joints	362
	(d) Backfilling	362
605.04	Cast in Place Cement Concrete Curbing.....	362
	(a) Excavation	363
	(b) Forms	363
	(c) Proportioning and Placing.....	363
	(d) Curb Turnouts and Combined Concrete Curb and Gutter Turnouts	363
	(e) Joints	363
	(f) Curing	364
	(g) Backfilling	364
	(h) Curb Machine	364
	(i) Integral Curb Walk.....	364
605.05	Reflecting Cement Concrete Curbing	364
605.06	Cement Concrete Center Curbing.....	364
605.07	HMA Curbing.....	365
	(a) Excavation	365
	(b) Preparation of Bed.....	365
	(c) Mixture	365
	(d) Placing.....	365
	(e) Painting and Sealing.....	365
605.08	Resetting Curbing	366
	(a) Salvage of Curbing	366
	(b) Curb Removal.....	366
	(c) Excavation	366

TABLE OF CONTENTS

Section	Title	Page
	(d) Resetting.....	366
	(e) Backfilling.....	366
605.09	Method of Measurement	366
605.10	Basis of Payment	366
606	Blank.....	367
607	PAVED SIDE DITCH OR CONCRETE GUTTER	367
607.01	Description.....	367
607.02	Materials	367
607.03	General Requirements	368
607.04	Cement Concrete Gutter and Turnout	368
607.05	Method of Measurement	368
607.06	Basis of Payment	368
608	SHOULDER DRAINS	369
608.01	Description.....	369
608.02	Materials	369
608.03	General Requirements	369
608.04	Method of Measurement	369
608.05	Basis of Payment	369
609	Blank.....	370
610	SURFACES FOR APPROACHES	370
610.01	Description.....	370
610.02	Materials	370
610.03	General Requirements	370
610.04	Existing Approaches and Crossovers	371
610.05	Cement Concrete Bridge Approach Pavement.....	371
	(a) Machine Method.....	371
	(b) Hand Method.....	371
610.06	Method of Measurement	372
610.07	Basis of Payment	372
611	CROSSOVERS, DRIVEWAYS AND MAILBOX INSTALLATIONS	373
611.01	Description.....	373
611.02	Materials	373
611.03	General Requirements	373
611.04	Temporary Crossovers.....	374
611.05	Mailbox Assembly	374
611.06	Method of Measurement	375
611.07	Basis of Payment	375
612	UNDERSEALING	376
612.01	Description.....	376
612.02	Materials	376
612.03	Shoulders.....	376
612.04	Drilled Holes	377
612.05	Pumping Asphalt	377
612.06	Method of Measurement	378
612.07	Basis of Payment	378
613	SALVAGED ROAD MATERIALS	378
613.01	Description.....	378
613.02	Materials	378
613.03	Construction Requirements	378
613.04	Method of Measurement	379
613.05	Basis of Payment	379

TABLE OF CONTENTS

Section	Title	Page
614	CONCRETE HEADER.....	379
614.01	Description.....	379
614.02	Materials	379
614.03	Cement Concrete Header	380
614.04	Reconstructed Cement Concrete Header.....	380
614.05	Method of Measurement	380
614.06	Basis of Payment	380
615	MONUMENTS, MARKERS AND PARKING BARRIERS.....	381
615.01	Description.....	381
615.02	Materials	381
615.03	Reinforced Cement Concrete Right-of-Way Markers	381
615.04	Monuments	381
615.05	Bench Mark Posts	382
615.06	Parking Barriers.....	382
615.07	Setting Right-of-Way Markers	382
615.08	Resetting Right-of-Way Markers	382
615.09	Setting Monuments.....	382
615.10	Re-Established Monuments.....	383
615.11	Setting Bench Mark Posts and Tablets.....	383
615.12	Reset Bench Mark Posts.....	383
615.13	Method of Measurement	383
615.14	Basis of Payment	384
616	RIPRAP AND SLOPEWALL	384
616.01	Description.....	384
616.02	Materials	384
616.03	Placing Dumped Riprap.....	384
616.04	Placing Revetment, Class 1, and Class 2 Riprap.....	385
616.05	Placing Uniform Riprap.....	385
616.06	Blank.....	385
616.07	Placing Grouted Riprap	385
616.08	Placing Precast Cement Concrete Riprap.....	385
616.09	Slopedwall.....	385
616.09.1	Undermined Paved Side Ditch.....	386
616.10	Installation of Geotextile Under Riprap	386
616.11	Method of Measurement	387
616.12	Basis of Payment	387
617	GEOGRID FOR SUBGRADE STABILIZATION OR MODIFICATION	389
617.01	Description.....	389
617.02	Materials	389
617.03	Foundation Preparation.....	389
617.04	Geogrid Placement	389
617.05	Fill Placement.....	390
617.06	Method of Measurement	390
617.07	Basis of Payment	390
618	Blank.....	390
619	PAINTING BRIDGE STEEL.....	390
619.01	Description.....	390
619.02	Materials	391
619.03	Quality Control and Quality Assurance	391
	(a) Acceptance Testing Definitions	391
	1. Lot.....	391
	2. Series.....	391

TABLE OF CONTENTS

Section	Title	Page
	3. Phase	391
	(b) Testing Procedure	392
	(c) Test Methods and Procedures	392
619.04	Prosecution of Work	392
619.05	Inspection Access to Bridges	393
619.06	Maintaining Traffic	393
619.07	Environmental and Safety Requirements.....	393
	(a) Pollution Control.....	393
	(b) Waste Disposal.....	394
	1. Laws to be Observed	394
	2. Time Limitations.....	394
	3. Marking of Spent Material Containers.....	394
	4. Instruction for Disposal of Paint Waste.....	395
	5. Instructions for Disposal of Other Project Generated Waste.....	395
619.08	Surface Preparation	396
	(a) Pressure Washing.....	396
	(b) Solvent Cleaning.....	396
	(c) Near-White Blast Cleaning.....	396
	(d) Commercial Blast Cleaning.....	396
	(e) Hand Tool Cleaning.....	396
	(f) Brush-Off Blast Cleaning	396
	(g) Power Tool Cleaning	396
	(h) Power Tool Cleaning to Bare Metal	397
619.09	Paint Systems.....	397
	(a) Structural Steel Paint System	397
	(b) Partial Paint System.....	397
619.10	Painting.....	397
	(a) Weather Limitations.....	397
	(b) Storage.....	398
	(c) Mixing	398
	(d) Thinning.....	398
	(e) Application of Paint	398
	(f) Curing Time.....	399
	(g) Stencil Identification	399
619.11	Shop Painting.....	399
619.12	Field Painting New Steel Bridge.....	400
619.13	Painting Existing Steel Bridges	400
619.14	Drain Castings Treatment.....	400
619.15	Claims	400
619.16	Responsibility for Damage.....	401
619.17	Method of Measurement	401
619.18	Basis of Payment	401
620	Blank.....	402
621	SEEDING AND SODDING	402
621.01	Description.....	402
621.02	Materials	402
621.03	Preparation of Ground Before Seeding	402
621.04	Preparation of Ground Before Applying Erosion Control Blankets	403
621.05	Applying Fertilizer, Seed, and Mulch.....	403
	(a) Fertilizer.....	403
	(b) Seed	403
	(c) Mulch	403
	1. Method A.....	404
	2. Method B.....	404

TABLE OF CONTENTS

Section	Title	Page
	3. Method C.....	404
	4. Method D.....	404
	5. Method E.....	405
	(d) Excelsior Blankets.....	405
	(e) Paper Mat.....	405
	(f) Straw Mat.....	405
	(g) Wood Cellulose Fiber Mulch.....	406
621.06	Seed Mixtures.....	406
	(a) Seed Mixture R.....	406
	(b) Seed Mixture U.....	406
	(c) Seed Mixture P.....	406
	(d) Seed Mixture CV.....	407
	(e) Seed Mixture D.....	407
	(f) Seed Mixture T.....	407
	1. Conventional Mix.....	407
	2. Color Mix.....	407
	(g) Seed Mixture Grass.....	408
	1. Type 1.....	408
	2. Type 2.....	408
	(h) Seed Mixture Legume.....	408
	1. Type 1.....	408
	2. Type 2.....	408
621.07	Mulched Seeding.....	408
621.08	Preparation of Ground Before Sodding.....	408
621.09	Laying Sod.....	409
621.10	Watering Sod.....	409
621.11	Seasonal Limitations.....	409
621.12	Method of Measurement.....	410
621.13	Basis of Payment.....	410
	(a) Warranty Bond.....	411
	(b) Changed Fertilizer.....	412
	(c) Mulching.....	412
622	PLANTING TREES, SHRUBS, AND VINES.....	412
622.01	Description.....	412
622.02	Materials.....	412
622.03	Care and Handling of Plants.....	413
	(a) Bare Rooted Plants.....	413
	(b) Balled and Burlapped Plants and Container Grown Plants.....	413
622.04	Collected Plants.....	414
622.05	Excavation for Plant Holes.....	414
622.06	Planting Season.....	414
622.07	Pruning.....	415
622.08	Planting, Backfilling, and Watering.....	415
	(a) Plants with Bare Roots.....	416
	(b) Balled and Burlapped Plants.....	416
	(c) Seedlings for Wildlife Habitat.....	416
622.09	Liquid Fertilizer Application.....	416
622.10	Mulching.....	416
622.11	Guying and Staking.....	416
622.12	Plant Protection.....	417
	(a) Borer Control Coatings.....	417
	(b) Wrapping for Rodent Protection.....	417
622.13	Retaining Walls and Tree Wells.....	417
622.14	Tree Root Protection.....	418
622.15	Pipe Underdrains.....	418

TABLE OF CONTENTS

Section	Title	Page
622.16	Damage to Plants	418
622.17	Grass and Weed Control	418
622.18	Care, Inspection, and Replacement	418
	(a) Care	418
	(b) Inspection and Replacement	419
622.19	Crown Vetch Plants and Seedlings	419
622.20	"Do Not Mow or Spray" Signs and "Do Not Disturb" Signs	420
622.21	Method of Measurement	420
622.22	Basis of Payment	420

SECTION 700 -- STRUCTURES

701	DRIVEN PILING	422
701.01	Description.....	422
701.02	Materials	422
701.03	Handling of Epoxy Coated Piles.....	422
701.04	Equipment for Driving Piles.....	422
	(a) Approval of Pile Driving Equipment.....	422
	1. Wave Equation Analysis Method	423
	2. Alternate Method	424
	(b) Pile Hammers	424
	1. Gravity Hammers.....	424
	2. Steam and Air Hammers	424
	3. Diesel Hammers	424
	4. Pile Driving Aids	425
	(c) Pile Driving Appurtenance.....	425
	1. Hammer Cushion	425
	2. Pile Drive Head	425
	3. Pile Cushion	425
	4. Leads	426
	5. Followers	426
	6. Jets.....	426
701.05	Test Piles	426
701.06	Driven Pile Capacity.....	427
	(a) Wave Equation Analysis Program, or WEAP.....	427
	(b) Dynamic Formula	427
	(c) Dynamic Pile Load Test.....	428
	(d) Static Load Test.....	429
	1. Load Test Procedure	429
	2. Hydraulic Jacks and Load Gages	430
	3. General Requirements.....	430
701.07	Piling Length	430
701.08	Required Bearing Capacity	430
701.09	Preparation and Driving.....	430
	(a) Pilot Holes	431
	(b) Location and Alignment Tolerance	432
	(c) Heaved Piles	432
	(d) Installation Sequence.....	432
	(e) Inspection.....	432
	(f) Pouring Concrete.....	432
701.10	Unsatisfactory Piles	433
701.11	Splicing Piles	433
	(a) Precast Prestressed Concrete Piles.....	433
	(b) Steel Piles and Steel Shells for Cast-in-Place Concrete Piles.....	433
701.12	Steel H Pile Tips.....	433

TABLE OF CONTENTS

Section	Title	Page
701.13	Cut-Off Lengths.....	434
701.14	Method of Measurement	434
701.15	Basis of Payment	434
	(a) Timber Piles Furnished.....	434
	(b) Timber Piles Driven.....	435
	(c) Epoxy Coated Piles.....	435
	(d) Prestressed Concrete Piles	435
702	STRUCTURAL CONCRETE	437
702.01	Description.....	437
702.02	Classes of Concrete	437
702.03	Materials	437
702.04	Shipping and Storage.....	438
702.05	Proportioning	438
702.06	Batching	440
	(a) Portland Cement	440
	(b) Water.....	440
	(c) Aggregates	440
	(d) Bins and Scales.....	441
	(e) Batching	441
702.07	Mixing	442
702.08	Mixing at Site of Work.....	442
702.09	Ready-Mixed Concrete.....	442
	(a) General Requirements	443
	(b) Mixers and Agitators.....	443
	(c) Mixing and Delivery	444
	(d) Non-Agitating Equipment.....	445
702.10	Pumping Concrete.....	446
702.11	Cold Weather Concrete	446
702.12	Consistency	447
702.13	Forms	447
	(a) Construction	447
	(b) Ties.....	448
	(c) Walls	448
	(d) Surface Treatment.....	448
	(e) Metal Forms	448
	1. Removable	448
	2. Permanent	448
	a. General.....	448
	b. Construction Requirements	448
	(f) Removal and Re-Use of Forms.....	450
	(g) Test Beams.....	451
702.14	Falsework and Centering.....	451
	(a) Design and Construction	452
	(b) Removal	453
702.15	Joints	453
	(a) Construction Joints	453
	(b) Expansion Joints	454
	(c) Folded Metal Joints.....	455
	(d) Sliding Joints	455
702.16	Drainage Pipes Through Concrete Masonry	455
702.17	Incased Pipes and Conduits.....	455
702.18	Roadway Surface Drainage.....	455
702.19	Pouring Bent Caps.....	455

TABLE OF CONTENTS

Section	Title	Page
702.20	Placing Concrete.....	455
	(a) General Requirements	455
	(b) Chutes and Troughs	456
	(c) Vibrating	456
	(d) Depositing Concrete Under Water	457
	(e) Placing Footing Concrete	457
	(f) Concrete Foundation Seal	458
702.21	Finishing Concrete Surfaces.....	458
	(a) Class 1 Finish.....	459
	(b) Class 2 Finish	459
	(c) Class 3 Finish.....	459
702.22	Curing Concrete	459
	(a) Protective Covering Curing Methods	460
	(b) Membrane Forming Curing Compound.....	460
	(c) Curing-Sealing Materials.....	460
702.23	Waterproofing.....	461
702.24	Application of Loads to and Acceptance of New Concrete.....	462
702.25	Field Drilled Holes in Concrete	463
702.26	Artificial Lighting	463
702.27	Method of Measurement	463
702.28	Basis of Payment	464
703	REINFORCING BARS	465
703.01	Description.....	465
703.02	Materials	465
703.03	Bar List.....	465
703.04	Protection of Materials	465
703.05	Bending.....	466
703.06	Placing and Fastening.....	466
703.07	Method of Measurement	467
703.08	Basis of Payment	468
704	CONCRETE FLOOR SLABS	469
704.01	Description.....	469
704.02	Materials	469
704.03	Forms	469
704.04	Placing Reinforcement and Concrete	469
704.05	Finishing Concrete	470
704.06	Curing	471
704.07	Method of Measurement	472
704.08	Basis of Payment	472
705	SIDEWALKS ON STRUCTURES	472
705.01	Description.....	472
705.02	Materials	472
705.03	Construction Requirements	472
705.04	Method of Measurement	473
705.05	Basis of Payment	473
706	RAILINGS.....	473
706.01	Description.....	473
706.02	Materials	473
706.03	Concrete Railing.....	474
706.04	Pipe Railing.....	474
706.05	Aluminum and Steel Railings	475
706.06	Method of Measurement	475
706.07	Basis of Payment	475

TABLE OF CONTENTS

Section	Title	Page
707	PRECAST AND PRESTRESSED CONCRETE STRUCTURAL MEMBERS	476
707.01	Description.....	476
707.02	Materials	476
707.03	General Requirements	476
707.04	Steel and Concrete Requirements	477
	(a) Reinforcing Steel.....	477
	(b) Welding Reinforcing Steel	477
	(c) Concrete	478
707.05	Forms	479
707.06	Placing and Finishing Cement Concrete	479
707.07	Removal of Forms and Curing.....	480
707.08	Handling and Shipping	481
707.09	Placing Structural Members	482
707.10	Method of Measurement	483
707.11	Basis of Payment	483
708	PNEUMATICALLY PLACED MORTAR	484
708.01	Description.....	484
708.02	Materials	484
708.03	Preparing Surface.....	484
708.04	Reinforcement.....	484
708.05	Proportioning and Mixing.....	485
708.06	Placing Mortar	485
708.07	Finishing	485
708.08	Method of Measurement	486
708.09	Basis of Payment	486
709	PORTLAND CEMENT CONCRETE SEALERS	486
709.01	Description.....	486
709.02	Materials	486
709.03	Surface Preparation	487
709.04	Environmental Requirements.....	487
	(a) General Requirements	487
	(b) Epoxy Penetrating Sealers	487
	(c) Other Portland Cement Concrete Sealers	487
	(d) Low Temperature Epoxy Penetrating Sealer	487
709.05	Sealer Application	487
	(a) General Requirements	487
	(b) Epoxy Penetrating Sealer.....	487
	(c) Other Portland Cement Concrete Sealers	488
	(d) Clear Sealers.....	488
	(e) Alternate To Concrete Sealers.....	489
709.06	Safety Precautions	489
709.07	Method of Measurement	489
709.08	Basis of Payment	489
710	REPOINTING MASONRY IN STRUCTURES	489
710.01	Description.....	489
710.02	Materials	489
710.03	Repointing Concrete Masonry	490
710.04	Repointing Rubble Masonry.....	490
710.05	Repointing Dressed Stone and Brick Masonry	490
710.06	Method of Measurement	490
710.07	Basis of Payment	490

TABLE OF CONTENTS

Section	Title	Page
711	STEEL STRUCTURES	491
711.01	Description.....	491
711.02	Materials	491
711.03	General Requirements	491
711.04	Certification of Fabricators	492
711.05	Shop Drawings	492
711.06	Storage of Materials.....	492
711.07	Mill Orders and Shipping Statements	492
711.08	Mill Test Reports	492
711.09	Notice of Beginning Work.....	493
711.10	Facilities for Inspection.....	493
711.11	Straightening Material	493
711.12	Finish	493
711.13	Flame Cutting	494
711.14	Edge Planing	494
711.15	Abutting Joints	495
711.16	End Connection Angles	495
711.17	Blank.....	495
711.18	Blank.....	495
711.19	Bent Plates	495
711.20	Fit of Stiffeners	496
711.21	Bolt Holes.....	496
	(a) High Tensile Strength Bolts, and Unfinished Bolts.....	496
	(b) Ribbed Bolts, Turned Bolts, or other Approved Bearing-Type Bolts	496
711.22	Punched Holes	497
711.23	Reamed or Drilled Holes.....	497
711.24	Subpunching and Reaming of Field Connections.....	497
711.25	Accuracy of Punched or Subdrilled Holes	498
711.26	Accuracy of Reamed Holes and Holes Drilled Full Size.....	498
711.27	Fitting for Bolting	498
711.28	Filler Plates	498
711.29	Toothed Expansion Plates.....	498
711.30	Blank.....	498
711.31	Blank.....	498
711.32	Welds	498
	(a) AWS Requirements	499
	(b) Edge Blocks.....	499
711.33	Stud Shear Connectors.....	499
711.34	Annealing and Stress Relieving.....	499
711.35	Eyebars	499
711.36	Facing of Bearing Surfaces	500
711.37	Pins and Rollers.....	500
711.38	Boring Pin Holes.....	500
711.39	Pin Clearances	501
711.40	Threads for Bolts and Pins	501
711.41	Pilot and Driving Nuts.....	501
711.42	Finishing Cast Steel	501
711.43	Finished Members.....	501
711.44	Shop Assembling	501
	(a) Full Truss or Girder Assembly.....	501
	(b) Progressive Beam or Girder Assembly	502
	(c) Full Chord Assembly	502
	(d) Progressive Chord Assembly.....	502
	(e) Special Complete Structure Assembly	502
711.45	Drifting of Holes.....	502

TABLE OF CONTENTS

Section	Title	Page
711.46	Match Marking	503
711.47	Shop Cleaning and Painting	503
711.47.1	Shop Cleaning and Storage of ASTM A 709M Grade 345W (ASTM A 709 Grade 50W) Steel	503
	(a) Hot Rolled Products	503
	(b) Welded Areas	503
711.48	Furnishing Bolts	503
711.49	Weighing of Members	503
711.50	Full Size Tests	503
711.51	Acceptance	503
711.52	Shipping	503
711.53	General Requirements	504
711.54	Delivery of Materials	504
711.55	Handling and Storing	504
711.56	Falsework	504
711.57	Bearings and Anchorages	505
711.58	Field Straightening Material	505
711.59	Field Assembly of Steel	505
711.60	Misfits	506
711.61	Pin Connections	506
711.62	Blank	506
711.62.1	Diaphragm Connections	506
711.63	Bolted Connections Using High Strength Bolts	506
	(a) General	506
	(b) Bolts, Nuts, and Washers	506
	(c) Bolted Parts	506
	(d) Installation	507
	1. Bolt Tension	507
	2. Washers	507
	3. Calibrated Wrench Tightening	507
	4. Turn-of-Nut Tightening	508
	(e) Inspection	508
711.64	Bolted Connections Using Other Than High Strength Bolts	509
711.65	Final Clean-Up	509
711.66	Structural Steel Cutting, Rivet and Bolt Removal, and Drilled Bolt Holes in Repair Projects	510
711.67	Jacking and Supporting Beams	510
711.67.1	Field Cleaning and Storage of ASTM A 709M Grade 345W (ASTM A 709 Grade 50W) Steel	510
711.68	Painting	510
711.69	Method of Measurement	510
711.70	Basis of Payment	510
	(a) Lump Sum Basis	511
	(b) Unit Weight Basis	512
712	TIMBER STRUCTURES	512
712.01	Description	512
712.02	Materials	513
712.03	General Requirements	513
712.04	Caps	514
712.05	Stringers	515
712.06	Bents	515
712.07	Wheel Guards and Railings	515
712.08	Painting	515
712.09	Single-Ply Plank Floors	516
712.10	Two-Ply Plank Floors	516
712.11	Method of Measurement	516
712.12	Basis of Payment	516

TABLE OF CONTENTS

Section	Title	Page
713	TEMPORARY BRIDGES AND APPROACHES	516
713.01	Description.....	516
713.02	Materials	517
713.03	General Requirements	517
713.04	Temporary Bridge	517
713.05	Temporary Approaches.....	517
713.06	Maintenance	517
713.07	Removal.....	518
713.08	Method of Measurement	518
713.09	Basis of Payment	518
714	CONCRETE CULVERTS AND RETAINING WALLS	519
714.01	Description.....	519
714.02	Materials	519
714.03	General Requirements	519
714.04	Extension of Existing Culverts	520
	(a) Precast Concrete Box Sections Extension.....	520
	(b) Cast-In-Place Concrete Culvert Extension.....	520
714.04.1	Precast Reinforced Concrete Box Section Joints.....	520
714.05	Sealing Existing Culverts	520
714.06	Method of Measurement	520
714.07	Basis of Payment	521
715	PIPE CULVERTS, AND STORM AND SANITARY SEWERS	522
715.01	Description.....	522
715.02	Materials	522
	(a) Type 1 Pipe	522
	(b) Type 2 Pipe	523
	(c) Type 3 Pipe	523
	(d) Type 4 Pipe	523
	(e) Type 5 Pipe	523
	(f) Slotted Drain Pipe.....	523
	(g) Slotted Vane Drain Pipe.....	524
	(h) End Bent Drain Pipe	524
	(i) Underdrain Outlet Pipe.....	524
	(j) Grated Box End Sections.....	524
715.02.1	General Requirements	524
715.03	Excavation	525
715.04	Laying Pipe.....	525
715.05	Joining Pipe.....	526
715.06	Tee and Stub-Tee Connections.....	526
715.07	Blank.....	527
715.08	Backfilling	527
715.09	Pipe End Sections, Anchors, Grated Box End Sections, and Safety Metal End Sections	528
715.10	Re-Laid Pipe.....	528
715.11	Method of Measurement	528
715.12	Basis of Payment	529
716	JACKED PIPE.....	534
716.01	Description.....	534
716.02	Materials	534
716.03	General Requirements	535
	(a) Jacking.....	535
	(b) Boring.....	536
716.04	Jacking Steel Pipe	536
716.05	Jacking Concrete Pipe	537

TABLE OF CONTENTS

Section	Title	Page
716.06	Method of Measurement	537
716.07	Basis of Payment	537
717	STRUCTURAL PLATE PIPE, PIPE-ARCHES, AND ARCHES	538
717.01	Description.....	538
717.02	Materials	538
717.03	General Requirements	538
717.04	Backfill	539
717.05	Re-Laid Pipe and Pipe-Arch.....	540
717.06	Blank.....	540
717.07	Concrete Paved Inverts	540
717.08	Method of Measurement	540
717.09	Basis of Payment	540
718	UNDERDRAINS	541
718.01	Description.....	541
718.02	Materials	541
718.03	Pipe Installation	542
718.04	Geotextile	542
718.05	Underdrain Outlets	542
718.06	Underdrain Outlet Protectors.....	542
718.07	Method of Measurement	543
718.08	Basis of Payment	543
719	TILE DRAINS	544
719.01	Description.....	544
719.02	Materials	544
719.03	Trench Excavation	544
719.04	Laying Tile	545
719.05	Backfilling	545
719.06	Blank.....	545
719.07	Method of Measurement	545
719.08	Basis of Payment	546
720	MANHOLES, INLETS, AND CATCH BASINS	546
720.01	Description.....	546
720.02	Materials	546
720.03	General Requirements	547
720.04	Grade Adjustment of Existing Structures	549
720.05	Method of Measurement	550
720.06	Basis of Payment	550
721	AUTOMATIC DRAINAGE GATES	551
721.01	Description.....	551
721.02	Materials	551
721.03	Construction Requirements	551
721.04	Method of Measurement	551
721.05	Basis of Payment	551
722	LATEX MODIFIED CONCRETE BRIDGE DECK OVERLAYS	552
722.01	Description.....	552
722.02	Materials	552
722.03	Storage and Handling of Materials	552
722.04	Proportioning	552
722.05	Preparation of the Bridge Floor.....	553
	(a) Concrete Removal.....	553
	1. Deck Surface.....	554
	2. Bridge Floor	554

TABLE OF CONTENTS

Section	Title	Page
	(b) Cleaning.....	555
722.06	Patching of the Bridge Floor	555
	(a) Full Depth Patching	555
	1. Patching with Bridge Deck Patching Concrete.....	555
	2. Patching with Latex Modified Concrete.....	555
	(b) Partial Depth Patching.....	555
	1. Patching with Bridge Deck Patching Concrete.....	555
	2. Patching with Latex Modified Concrete.....	555
722.06.1	Overlay Dam	555
722.07	Mixing.....	556
722.08	Placing and Finishing.....	556
722.09	Texturing.....	557
722.10	Curing	558
722.11	Calibration of Continuous Mixers	559
	(a) Frequency	559
	(b) Equipment.....	559
	(c) Pre-calibration.....	559
	(d) Calibration	559
	1. Cement Meter	559
	2. Water Flow Meter	560
	3. Aggregate Bin Gates.....	560
	4. Latex Throttling Valve.....	560
	5. Admixture Dispensers.....	560
722.12	Patching an Existing Bridge Deck Overlay.....	560
	(a) Materials.....	560
	(b) Storage and Handling of Materials	560
	(c) Proportioning	560
	(d) Preparation of the Bridge Floor.....	561
	(e) Patching	561
	(f) Mixing.....	561
	(g) Placing and Finishing	561
	(h) Texturing.....	561
	(i) Curing	561
	(j) Calibration of Continuous Mixers.....	561
722.13	Method of Measurement	561
722.14	Basis of Payment	562
724	STRUCTURAL EXPANSION JOINTS	563
724.01	Description.....	563
	(a) Structural Expansion Joint.....	563
	(b) Replacement of Existing Structural Expansion Joint.....	563
	(c) Replacement of Existing Structural Expansion Joint Seal.....	564
724.02	Materials	564
	(a) Expansion Joint SS	564
	(b) Expansion Joint M.....	564
724.03	General Requirements	564
	(a) Expansion Joint SS	565
	(b) Expansion Joint BS.....	565
	(c) Expansion Joint M.....	565
	(d) Replacement of Existing Structural Expansion Joint.....	565
	(e) Replacement of Existing Structural Expansion Joint Seal.....	566
724.04	Method of Measurement	566
724.05	Basis of Payment	566

TABLE OF CONTENTS

Section	Title	Page
SECTION 800 -- TRAFFIC CONTROL DEVICES AND LIGHTING		
801	TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS.....	567
801.01	Description.....	567
801.02	Materials	567
801.02.1	General Requirements	567
801.03	Construction Signs.....	568
801.04	Temporary Worksite Speed Limit Sign Assemblies.....	569
801.05	Detour Route Marker Assembly	571
801.05.1	Road Closure Sign Assembly	571
801.06	Vehicle Warning Lights	571
801.07	Barricades	571
	(a) Type III-A Barricade	572
	(b) Permanent Type III-A Barricade.....	572
	(c) Type III-B Barricade	572
801.08	Cones, Flexible Channelizers, and Tubular Markers.....	572
801.09	Temporary HMA Divider.....	573
801.10	Drums.....	573
801.11	Temporary Illumination	574
801.12	Construction Warning Lights.....	574
	(a) Type A.....	575
	(b) Type B.....	575
	(c) Type C.....	575
801.13	Flashing Arrow Sign.....	575
801.14	Temporary Pavement Marking	575
	(a) Types of Temporary Pavement Markings.....	576
	1. Painted Lines	576
	2. Temporary Pavement Marking Tape.....	576
	a. Type I	577
	b. Type II	577
	3. Temporary Raised Pavement Marker	577
	4. Buzz Strips	577
	(b) Marking Method On Two-Lane Pavements	577
	(c) Marking Method On Multi-Lane Pavements	577
	1. Lane Line Markings.....	578
	a. Base Course	578
	b. Intermediate Course	578
	c. Surface	578
	2. Gore Area Markings.....	578
	a. Base Course	578
	b. Intermediate Course	578
	c. Surface	578
	3. Acceleration, Deceleration, and Ramp Area Markings.....	578
	a. Base Course	578
	b. Intermediate Course	579
	c. Surface	579
	4. Narrow Bridge Markings.....	579
	a. Base Course	579
	b. Intermediate Course	579
	c. Surface	579
	5. Time of Installation.....	579
801.15	Traffic Control for Temporary Traffic Stoppage	579
	(a) On Multi-Lane Divided Highways	579
	(b) On Non-Divided Highways.....	580
801.16	Maintenance of Traffic for Snowplowable Marker or Reflector Installation.....	580

TABLE OF CONTENTS

Section	Title	Page
801.17	Method of Measurement	580
801.18	Basis of Payment	580
802	GROUND MOUNTED SIGNS	583
802.01	Description.....	583
802.02	Materials	583
802.03	Location of Signs	584
802.04	Excavation	584
802.05	Installing Posts and Signs	584
802.06	Removal or Relocation of Signs or Support Assemblies	585
802.07	Remove and Reset Roadway and Bridge Reference Signs.....	586
802.08	Shop Drawings of Signs and Sign Structures	586
802.09	Final Clean-Up.....	586
802.10	Method of Measurement	586
802.11	Basis of Payment	586
803	OVERHEAD SIGN STRUCTURES	588
803.01	Description.....	588
803.02	Materials	588
803.03	Shop Drawings.....	588
803.04	Excavation	588
803.05	Placing Concrete.....	588
803.06	Erection.....	589
	(a) Under Traffic	589
	(b) Trusses.....	589
	(c) Monotube.....	589
	(d) Cantilever	589
	(e) Bridge Brackets	590
803.07	Welding Aluminum Alloys for Highway Structures	590
	(a) Base Metals	590
	(b) Welding Processes.....	590
	(c) Filler Metal	590
	(d) Shielding Gases	591
	(e) Preparation of Materials.....	591
	(f) Welding Procedure.....	592
	(g) Weld Quality	592
	(h) Inspection	593
	(i) Corrections	593
	(j) Qualification of Procedures, Welders, and Welding Operators.....	594
803.08	Removal of Overhead Signs and Sign Structures	594
803.09	Final Clean-Up.....	594
803.10	Method of Measurement	594
803.11	Basis of Payment	594
804	DELINEATORS.....	595
804.01	Description.....	595
804.02	Materials	595
804.03	Delineators and Barrier Delineators.....	596
804.04	Posts.....	596
804.05	Flexible Delineator Posts.....	596
804.06	Method of Measurement	596
804.07	Basis of Payment	596
805	TRAFFIC SIGNALS	597
805.01	Description.....	597
805.02	Materials	597
805.03	General Requirements	597

TABLE OF CONTENTS

Section	Title	Page
805.04	Pole Installation.....	599
805.05	Placing Signal Heads.....	600
805.06	Grounding.....	600
805.07	Wire and Cable Installations.....	600
805.08	Controller Cabinet, Signal Service, and Detector Housing Installation.....	601
805.09	Loop Wire Detector Installation.....	602
	(a) Megohm Test Before Splice is Made at Detector Housing for Loop Wire.....	603
	(b) Megohm Test Before Splice is Made at Detector Housing for Lead-in Cable.....	603
	(c) Megohm Test After Splice is Completed at Cabinet.....	603
	(d) Vehicle Simulator Test.....	603
	(e) Acceptance Criteria.....	603
805.10	Magnetometer and Microloop Detectors.....	604
805.11	Steel Conduit.....	604
805.12	PVC Conduit.....	605
805.13	Foundations.....	605
805.14	Final Clean-Up.....	605
805.15	Method of Measurement.....	605
805.16	Basis of Payment.....	606
806	TEMPORARY TRAFFIC SIGNALS.....	609
806.01	Description.....	609
806.02	Materials.....	609
806.03	General Requirements.....	610
806.04	Pole Installation.....	610
806.05	Signal Heads.....	610
806.06	Grounding.....	611
806.07	Wire and Cable Installations.....	611
806.08	Controller.....	611
806.09	Controller Cabinet, Signal Service, and Detector Housing Installation.....	611
806.10	Loop Detector Installation.....	612
806.11	Conduit.....	612
806.12	Final Clean-Up.....	612
806.13	Method of Measurement.....	612
806.14	Basis of Payment.....	612
807	HIGHWAY ILLUMINATION.....	612
807.01	Description.....	612
807.02	Maintenance of Highway Illumination.....	612
807.03	Materials.....	612
807.04	Excavation.....	613
	(a) Trench Excavation.....	613
	(b) Foundation Excavation.....	613
	(c) Landscape Replacement.....	614
807.05	Backfilling.....	614
807.06	Placing Conduit.....	614
807.07	Connections in Base of Lighting Standards.....	615
807.08	Placing Wire and Cable.....	616
	(a) Underground Through Cable-duct.....	616
	1. Cable-duct.....	616
	2. Cable Markers.....	617
	(b) Underground Through Conduit.....	617
	1. Cable-duct.....	617
	2. Cable Markers.....	617
	(c) In Conduit Risers.....	617
	(d) Through Conduit in Bridge Coping.....	617
	(e) Aerial Cable.....	618

TABLE OF CONTENTS

Section	Title	Page
807.09	Lighting Handholes	618
807.10	Concrete Foundations For Lighting Standards	618
	(a) Cast-in-Place Foundations	619
	(b) Precast Foundations	619
	(c) Grading of Foundations.....	619
807.11	Placing Lighting Standards	619
	(a) Lighting Standards Under 24 m (80 ft) in Height.....	619
	(b) High Mast Lighting Standards of 24 m (80 ft) Height and Over.....	620
807.12	Grounding.....	620
807.13	Luminaire Installation	621
	(a) Roadway Luminaires.....	621
	(b) Sign Luminaires.....	622
	(c) Underpass Luminaires	622
	(d) High Mast Luminaires.....	622
807.14	Sign, Underpass, Roadway, and High Mast Lighting Location Identification.....	623
807.15	Service Point Power Entry	623
	(a) Types of Service Points.....	623
	1. Type I Service Point.....	623
	2. Type II Service Point.....	623
	(b) Sign and Underpass Circuits.....	624
	(c) Multiple Relay Switches.....	624
807.16	Testing of Highway Lighting System	624
	(a) Testing Lighting Circuitry	624
	(b) Testing and Inspecting Luminaires	625
807.17	Pay Item and Installation Summary Sheets	625
807.18	Method of Measurement	625
	(a) From the Face of the Concrete Foundation to the Center of the Handhole or Face of the Next Concrete Foundation	626
	(b) From Lighting Standard Bases or Handholes to Switch Boxes at Underpasses	626
	(c) From End to End of the Conduit when the Cable is in Conduit under a Roadway Surface or Shoulder	626
807.19	Basis of Payment	626
808	PAVEMENT TRAFFIC MARKINGS.....	628
808.01	Description.....	628
808.02	Materials	629
808.03	General Requirements	629
808.04	Longitudinal Markings	629
	(a) Center Lines	630
	(b) Lane Lines	630
	(c) Edge Lines	630
	(d) Barrier Lines.....	630
808.05	Transverse Markings.....	630
808.05.1	Curb Markings	631
808.06	Pavement Marking Material Application and Equipment.....	631
	(a) Traffic Paint	631
	1. Application.....	631
	2. Equipment.....	631
	(b) Durable Pavement Marking Material.....	632
	1. Thermoplastic.....	632
	a. Application	632
	b. Equipment.....	632
	2. Preformed Plastic	632
	a. Application	632
	b. Equipment.....	633

TABLE OF CONTENTS

Section	Title	Page
	3. Epoxy	633
	a. Application	633
	b. Equipment	633
808.07	Marking Protection and Maintenance of Traffic	633
	(a) Vehicle Signs	634
	(b) Vehicle Warning Lights	634
	(c) Cones	634
	(d) Front Escort Vehicles	634
	(e) Marking Application Vehicles	634
	(f) Rear Escort Vehicles	634
808.08	Warranty for Durable Pavement Marking Material	635
808.09	Removal of Pavement Markings	635
808.10	Snowplowable Raised Pavement Markers	636
	(a) Surface Preparation	636
	(b) Location	636
	(c) Reflector Color	636
	(d) Installation	636
	(e) Removal of Markers	636
	(f) Replacement of Prismatic Reflectors	637
808.11	Method of Measurement	637
808.12	Basis of Payment	638

SECTION 900 -- MATERIALS DETAILS

901	HYDRAULIC CEMENT AND POZZOLANS	640
901.01	Hydraulic Cement	640
	(a) General	640
	(b) Portland Cement	640
	1. Requirements	640
	2. Acceptance Criteria	641
	a. General Requirements	641
	b. Requirements for Domestic Source Qualification	641
	c. Requirements for Foreign Source Qualification	642
	d. Certification	642
	(c) Masonry Cement	642
901.02	Fly Ash Used as a Pozzolan	642
	(a) General	643
	(b) Acceptance Criteria	643
	1. Requirements	643
	2. Test and Calibration Procedure	643
	3. Documentation	644
901.03	Ground Granulated Blast Furnace Slag Used as a Pozzolan	644
	(a) General	644
	(b) Acceptance Criteria	645
	1. Requirements	645
	2. Test and Calibration Procedure	645
	3. Documentation	645
901.04	Microsilica Used As a Pozzolanic Mineral Admixture	646
	(a) General	646
	(b) Acceptance Criteria	646
	1. Requirements	646
	2. Frequency of Testing	647
	3. Test and Calibration Procedure	647
	4. Documentation	647

TABLE OF CONTENTS

Section	Title	Page
902	ASPHALT MATERIALS	648
902.01	Asphalt.....	648
	(a) Performance Graded Asphalt Binders.....	648
	(b) Asphalt Emulsions.....	650
	(c) Cutback Asphalts	653
	1. Medium Curing Asphalts With and Without Additives.....	653
	2. Slow Curing Asphalts With and Without Additives	653
	(d) Utility Asphalt.....	654
	(e) Asphalt for Coating Corrugated Metal Pipe	654
902.02	Sampling and Testing Asphalt Materials	655
902.03	Application Temperatures.....	660
903	CLASSIFICATION OF SOILS.....	660
903.01	Definitions	660
903.02	Soils Having 0 to 19 Percent Retained on 2.00 mm (No. 10) Sieve	661
903.03	Soils Having 20 Percent or More Retained on 2.00 mm (No. 10) Sieve and More Than 20 Percent Passing 75 μ m (No. 200) Sieve	661
903.04	Soils Having 20 Percent or More Retained on 2.00 mm (No. 10) Sieve and Less Than 20 Percent Passing 75 μ m (No. 200) Sieve	661
903.05	Organic Soils	662
903.06	Marly Soils.....	662
904	AGGREGATES	662
904.01	Fine Aggregates.....	662
	(a) For Portland Cement Concrete.....	662
	(b) For HMA Mixtures	663
	(c) For Pneumatic Placement	664
	(d) For Mortar	665
	(e) Mineral Filler.....	665
	(f) Snow and Ice Abrasives.....	665
	(g) Sizes of Fine Aggregates	666
	(h) Sampling and Testing	666
904.02	Coarse Aggregates	666
	(a) General Requirements	666
	(b) Classification of Aggregates	669
	(c) Coarse Aggregate Angularity.....	670
	(d) Surface Aggregate Requirements	670
	(e) Sizes of Coarse Aggregates	672
	(f) Sampling and Testing.....	673
904.03	Exceptions to AASHTO Standard Methods	673
	(a) Exceptions to AASHTO T 2.....	673
	(b) Exceptions to AASHTO T 11, T 27, and T 37	673
	(c) Exceptions to AASHTO T 27 for Coarse Aggregates	673
	(d) Blank.....	674
	(e) Exceptions to AASHTO T 103 and T 104	674
	(f) Exceptions to AASHTO T 85.....	674
904.04	Riprap.....	674
	(a) Dumped Riprap	675
	(b) Revetment, Class 1, and Class 2 Riprap	675
	(c) Grouted Riprap.....	675
	(d) Uniform Riprap	675
	(e) Precast Cement Concrete Riprap	675
905	MASONRY UNITS.....	676
905.01	Clay or Shale Brick	676
	(a) Sewer Brick.....	676

TABLE OF CONTENTS

Section	Title	Page
	(b) Manhole Brick	676
	(c) Building Brick	676
905.02	Concrete Brick	676
905.03	Concrete Masonry Blocks.....	676
906	JOINT MATERIALS.....	676
906.01	Joint Fillers	676
906.02	Joint Sealing Materials.....	676
	(a) Joint Sealers.....	676
	1. Silicone Joint Sealants.....	676
	a. Physical Requirements	676
	b. Field Evaluation.....	676
	c. Specific Requirements for Installation of Silicone Joint Sealant.....	677
	d. Certification.....	677
	2. Hot Poured Joint Sealant	677
	a. General Requirements.....	677
	b. Packaging and Marking.....	677
	c. Requirements for Installation	677
	d. Sampling and Testing	677
	3. Preformed Elastomeric Joint Seals.....	677
	(b) Backer Rod	678
	1. Requirements	678
	2. Certification.....	678
906.03	Joint Mortar.....	678
906.04	Rubber Type Gaskets	678
906.05	Bituminous Mastic Pipe Joint Sealer.....	678
	(a) General Requirements	678
	(b) Detail Requirements	678
	(c) Certification.....	679
906.05.1	Joint Membrane System for Precast Reinforced Concrete Box Sections.....	679
906.06	Bridge Expansion Joints	680
	(a) Type SS.....	680
	(b) Type BS2, BS6, BS8, BS9, BS11, and 1-A.....	680
	(c) Type M	681
907	CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS.....	683
907.01	Non-Reinforced Concrete Pipe	683
907.02	Reinforced Concrete Pipe.....	683
907.03	Reinforced Concrete Horizontal Elliptical Pipe	683
907.04	Precast Concrete Manholes, Inlets, and Catch Basins	683
907.05	Precast Reinforced Concrete Box Sections	684
907.06	Blank.....	684
907.07	Blank.....	684
907.08	Clay Pipe.....	684
907.09	Perforated Clay Pipe.....	684
907.10	Blank.....	684
907.11	Drain Tile	684
907.12	Blank.....	685
907.13	Blank.....	685
907.14	Blank.....	685
907.15	Blank.....	685
907.16	Plastic Pipe Manufacturer Requirements.....	685
907.17	Corrugated Polyethylene Drainage Tubing.....	686
907.18	Perforated Polyvinyl Chloride Semicircular Pipe	686
907.19	Corrugated Polyethylene Pipe.....	686
907.20	Ribbed Polyethylene Pipe.....	686

TABLE OF CONTENTS

Section	Title	Page
907.21	Smooth Wall Polyethylene Pipe	686
907.22	Profile Wall Polyvinyl Chloride Pipe.....	686
907.23	Smooth Wall Polyvinyl Chloride Pipe.....	686
907.24	Smooth Wall Pipe for Outlets	686
	(a) Type PSM Polyvinyl Chloride Pipe and Fittings	687
	(b) Schedule 40 Polyvinyl Chloride Pipe.....	687
907.25	Solvent Cements for Polyvinyl Chloride Pipe and Pipe Fittings.....	687
907.26	Elastomeric Seals	687
908	METAL PIPE.....	687
908.01	Blank.....	687
908.02	Corrugated Steel Pipe and Pipe-Arches	687
908.03	Blank.....	688
908.04	Corrugated Aluminum Alloy Pipe and Pipe-Arches	688
908.05	Blank.....	688
908.06	Metal End Sections.....	688
908.07	Fiber Bonded Fully Bituminous Coated Corrugated Steel Culvert Pipe and Pipe-Arches	688
908.08	Polymer Precoated Galvanized Corrugated Steel Culvert Pipe and Pipe-Arches	690
908.09	Structural Plate Pipe, Pipe-Arches, and Arches	690
	(a) Steel	690
	(b) Aluminum Alloy.....	690
908.10	Cast Iron Soil Pipe	691
908.11	Steel Pipe.....	691
908.12	Straps, Hook Bolts and Nuts Used in Anchors.....	691
908.13	Fully Bituminous Coated and Lined Corrugated Steel Pipe and Pipe-Arches.....	691
908.14	Slotted Drain or Slotted Vane Drain Pipe.....	691
909	PAINT AND LIQUID EPOXY	692
909.01	General Requirements	692
909.02	For Metal	692
	(a) Zinc Primers	692
	1. Two Component and Multi-Component Inorganic Zinc Silicate Primer	692
	2. Single Package Inorganic Zinc Silicate Primer.....	693
	3. Organic Zinc Primer	693
	4. Approval of Formulation	693
	5. Reapproval of Formulation	694
	(b) Epoxy Intermediate Paint	694
	(c) Polyurethane Finish Coat.....	695
	(d) Waterborne Finish Paint.....	695
	1. Vehicle Component	695
	2. Pigment Component.....	695
	3. Mixed Paint Properties.....	695
	4. Color	696
	5. Approval of Formulation	696
	(e) Finish Coat for Weathering Steel	697
909.03	Structural Steel Coating System	697
	(a) Toxicity	697
	(b) Resistance	697
	(c) Approval of Structural Steel Coating System.....	697
	(d) Structural Steel Coating System Re-approval.	698
909.04	Field Paint for Wood or Metal	698
909.05	White and Yellow Traffic Paint.....	699
	(a) Standard Traffic Paint.....	699
	1. General Requirements.....	699
	2. Specific Requirements	700

TABLE OF CONTENTS

Section	Title	Page
	(b) Fast Dry Traffic Paint	700
	1. General Requirements.....	700
	2. Specific Requirements	701
	(c) White and Yellow Waterborne Traffic Paint	702
	1. Composition Requirements	703
	2. Specific Requirements	703
	3. Formulation Approval	705
	4. Formulation Reapproval.....	706
909.06	Blank.....	706
909.07	Miscellaneous Paints and Ingredients	706
	(a) Stencil Paint.....	706
	(b) Zinc Chromate Paint.....	706
909.08	Blank.....	706
909.09	Epoxy Penetrating Sealers	706
	(a) Polysulfide Type	706
	(b) Unmodified Type.....	707
	(c) Specific Requirements	707
	(d) Low Temperature Epoxy Penetrating Sealer	709
	(e) Packaging and Marking	710
	(f) Approval of Formulation	710
909.10	Proprietary Portland Cement Concrete Sealers	710
909.11	Epoxy-Resin-Base System for Bonding Plastic Concrete to Hardened Concrete	711
910	METAL MATERIALS.....	711
910.01	Reinforcing Bars and Dowel Bars	711
	(a) General	711
	(b) Specific Requirements	712
	1. Billet Steel Bars	712
	2. Threaded Tie Bar Assembly	712
	3. Splicing Systems	712
	4. Blank	712
	5. Welded Steel Wire Fabric for Concrete Reinforcement.....	712
	6. Welded Deformed Steel Wire Fabric for Concrete Reinforcement	713
	7. Uncoated 7 Wire Strand for Prestressed Concrete.....	713
	8. Steel Spiral Reinforcement.....	713
	9. Epoxy Coated Reinforcing Bars.....	713
	10. Dowel Bars.....	714
	(c) Inspection, Sampling, and Testing.....	715
910.02	Structural Steel	715
	(a) Structural Steel	715
	(b) High Strength Structural Steel.....	715
	(c) Charpy V-Notch Toughness Tests.....	715
	(d) Mill Test Reports	716
	(e) High Strength Bolts, Nuts, and Washers	716
	1. General Use.....	716
	2. Assembly of Structural Steel in Bridges	716
	a. Bolts	716
	b. Nuts.....	716
	c. Tests	716
	(1) Rotational Capacity	717
	(2) Proof Loads	717
	(3) Wedge Tension Test.....	717
	d. Certification.....	717
	(f) Bolts other than High Strength Bolts.....	717
	1. General.....	717
	2. Unfinished Bolts.....	717

TABLE OF CONTENTS

Section	Title	Page
	3. Turned Bolts	717
	4. Ribbed Bolts	718
910.03	Permanent Metal Forms.....	718
910.04	Steel Forgings and Steel Shafting.....	718
	(a) Carbon Steel Forgings	718
	(b) Cold Finished Carbon Steel Shafting	718
	(c) Alloy Steel Forgings	718
	(d) Certification	718
910.05	Castings	719
	(a) Steel Castings.....	719
	1. Steel Castings for Highway Bridges.....	719
	2. Chromium Alloy Steel Castings.....	719
	(b) Iron Castings.....	719
	(c) Ductile Iron Castings.....	720
	(d) Malleable Castings	720
	(e) Carbon Steel Castings.....	720
910.06	Bronze and Copper Alloy	720
	(a) Bronze Castings	720
	(b) Copper Alloy Plates.....	720
910.07	Steel Drain Pipe.....	720
910.08	Blank.....	721
910.09	Guardrail	721
	(a) Steel Beam Rail	721
	(b) Aluminum Rail.....	722
910.10	Guardrail Posts	722
	(a) Steel Guardrail Posts	722
	(b) Aluminum Guardrail Posts.....	722
	(c) Wood Guardrail Posts.....	722
910.11	Guardrail Accessories, Fittings, and Hardware.....	722
	(a) For Steel Beam Guardrail	722
	(b) For Aluminum Guardrail.....	724
	(c) For Steel Tube Guardrail.....	724
910.12	Samples and Certification of Guardrail, Posts, Accessories, Fittings, and Hardware.....	725
	(a) Control Procedure for Furnishing Steel Beam Guardrail and Accessories.....	725
	(b) Aluminum Guardrail.....	726
910.13	Steel Fence Posts	726
	(a) Tubular Steel Fence Posts.....	726
	1. Group 1	727
	2. Group 2	727
	(b) Fence Fastenings.....	727
910.14	Sign Posts	727
	(a) Steel, Flanged, Channel Posts.....	727
	1. General Requirements.....	727
	2. Deflection Test Requirements	729
	3. Type of Posts	729
	(b) Wide Flange Posts.....	729
	(c) Structural Steel Posts.....	730
	(d) Structural Aluminum Posts	730
	(e) Square Steel Posts.....	730
	1. Steel	730
	2. Fabrication	730
	3. Protective Coating.....	730
910.15	Delineator Posts.....	731
910.16	Copper Flashing	731
910.17	Bronze or Copper Alloy Plates.....	731

TABLE OF CONTENTS

Section	Title	Page
910.18	Fence, Fittings, and Gates	732
	(a) Farm Field or Woven Wire Fence.....	732
	(b) Steel Fabric Chain Link Fence.....	732
	1. Tension Wire	733
	2. Stretcher Bars, Truss Rods, and Turnbuckles	733
	3. Braces	733
	4. Barbed Wire.....	733
	(c) Aluminum Fabric Chain Link Fence.....	734
	(d) Gates	736
	1. Steel Gates.....	736
	2. Aluminum Gates	736
	(e) Control Procedures for Furnishing Fence and Accessories	736
	1. General Requirements.....	736
	2. Suppliers of Pretested Approved Stockpiled Material.....	737
	3. Suppliers Not Furnishing Pretested Approved Stockpiling Material	737
910.19	Overhead Sign Structures	737
	(a) Aluminum Overhead Sign Structures, Box Truss and Bridge Attached	738
	(b) Steel Overhead Sign Structures, Box Truss, Cantilever, Monotube, and Bridge Attached	738
910.20	Blank.....	739
910.21	Steel Sheet Piling	740
911	WOOD MATERIALS.....	740
911.01	Untreated Lumber	740
	(a) General	740
	1. Boards.....	740
	2. Dimension Lumber.....	740
	3. Structural Lumber.....	740
	4. Timbers	740
	5. Timbers, Round.....	740
	6. Yard Lumber	740
	7. Surfaced or Dressed Lumber	741
	8. Rough Lumber	741
	(b) Species and Grade	741
	(c) Inspection.....	741
	(d) Tolerances.....	741
	(e) Untreated Piling.....	742
911.02	Treated Lumber.....	743
	(a) General	743
	(b) Bridge Lumber	743
	(c) Piling.....	743
	(d) Guardrail Posts, Braces, and Battens.....	743
	(e) Sign Posts	744
	(f) Sawed Timber Posts and Blocks for Thrie-Beam and W-Beam Guardrail	744
	1. Species and Grades	744
	2. Department Grade GRP	746
	a. Splits.....	746
	b. Checks	746
	c. Shakes	746
	d. Stains	746
	e. Slope of Grain	746
	f. Wane.....	747
	g. Knots	747
	3. Department Grade GRB	747
	a. Splits.....	747
	b. Checks	747
	c. Shakes	747

TABLE OF CONTENTS

Section	Title	Page
	d. Stains	747
	e. Wane	747
	f. Knots	747
4.	General Requirements.....	747
	a. Decay.....	747
	b. Unsound Wood.....	747
	c. Crook or Bow.....	747
	d. Dimensional Tolerances	747
5.	Pressure Treating Posts and Blocks.....	748
	a. Machining	748
	b. Blank	748
	c. Inspection Before Treatment	748
	d. Test for Moisture Content	748
	e. Preservative Treatment.....	748
	f. Material for Preservative Treatments	748
	g. Treatment Methods	748
	h. Sorting and Spacing.....	748
	i. Conditioning.....	749
	j. Blank	750
	k. Inspection During Treatment	750
	l. Retentions	750
	m. Penetration	750
	n. Inspection After Treatment.....	751
	o. Branding	751
	p. Conformance.....	751
	q. Records	751
	r. Independent Inspections	752
6.	Field Treatment of Posts and Blocks	752
7.	Rejection for Degrade After Treatment.....	752
(g)	Preservatives.....	752
	1. Waterborne Preservatives	752
912	CONCRETE CURING MATERIALS AND ADMIXTURES.....	753
912.01	Curing Materials.....	753
	(a) Burlap Cloth made from Jute or Kenaf	753
	(b) Waterproof Paper Blankets	753
	(c) White Polyethylene Sheeting, Film	753
	(d) White Burlap Polyethylene Sheet.....	753
	(e) Liquid Membrane Forming Compounds	753
912.02	Curing-Sealing Materials.....	753
912.03	Admixtures for Use in Concrete.....	754
	(a) Air Entraining Admixtures.....	754
	(b) Chemical Admixtures for Concrete	754
	1. Type A	754
	2. Type B	754
	3. Type C	754
	4. Type D.....	754
	5. Type E	754
	6. Type F	754
	7. Type G.....	755
	8. High Range Water Reducing and High Range Water Reducing and Retarding Admixture Systems	755
	(c) Certification.....	755
	(d) Approved Admixtures	758
	(e) Performance of Admixtures	758
912.04	Latex Modifiers.....	758
912.05	Mineral Admixtures.....	758

TABLE OF CONTENTS

Section	Title	Page
913	MISCELLANEOUS	759
913.01	Water	759
913.02	Calcium Chloride.....	759
913.03	Sodium Chloride.....	759
913.04	Hydrated Lime	759
913.05	Precast Concrete Curbing.....	759
913.06	Precast Concrete Units Not Otherwise Covered.....	759
913.07	Flexible Delineator Posts.....	760
913.07.1	Flexible Channelizer and Flexible Tubular Marker.....	760
913.08	Delineators.....	760
	(a) Acrylic Plastic Delineators.....	760
	(b) Reflective Sheeting Delineators.....	761
	(c) Barrier Delineators	761
913.09	Glass Beads	762
913.10	Traffic Signs.....	763
	(a) Sheet Signs	764
	(b) Panel Signs.....	765
	(c) Flexible Roll-Up Prismatic Reflective Sign.....	766
	1. Reflectivity	766
	2. Color	767
	3. Sheeting.....	767
	4. Durability.....	767
	5. Impact Resistance.....	767
	6. Sign Face Backing Fabric	767
	7. Cross Brace Assembly and Attaching Fasteners	768
	8. General Characteristics and Packaging	768
	9. Basis of Use.....	769
	(d) Reflective Sheeting.....	769
	1. General.....	769
	a. Reflectivity	769
	b. Color	769
	c. Adhesive	769
	d. Sheeting.....	770
	e. Durability	770
	f. Impact Resistance	771
	g. General Characteristics and Packaging	771
	2. Enclosed Lens, Engineer Grade, and Super Engineer Grade, Reflective Sheeting.....	771
	a. Reflectivity	771
	b. Color	772
	c. Adhesive	773
	d. Sheeting.....	773
	e. Durability	773
	f. Impact Resistance	773
	g. General Characteristics and Packaging	773
	3. Encapsulated Lens, High Intensity, Reflective Sheeting	773
	a. Reflectivity	774
	b. Color	774
	c. Adhesive	775
	d. Sheeting.....	775
	e. Durability	775
	f. Impact Resistance	775
	g. General Characteristics and Packaging	775
	4. Flexible Encapsulated Lens Reflective Sheeting, High Intensity	775
	a. Reflectivity	776
	b. Color	776

TABLE OF CONTENTS

Section	Title	Page
	c. Adhesive	776
	d. Sheeting	776
	e. Durability	776
	f. Impact Resistance	776
	g. General Characteristics and Packaging	776
	5. Prismatic Lens, High Intensity, Reflective Sheeting	776
	a. Reflectivity	777
	b. Color	777
	c. Adhesive	777
	d. Sheeting	777
	e. Durability	777
	f. Impact Resistance	777
	g. General Characteristics and Packaging	777
	6. Prismatic Lens, Super High Intensity, Reflective Sheeting	778
	a. Reflectivity	778
	b. Color	778
	c. Adhesive	778
	d. Sheeting	778
	e. Durability	778
	f. Impact Resistance	778
	g. General Characteristics and Packaging	778
	(e) Letters, Numerals, Symbols, and Accessories	778
	1. Embossed Reflective Sheeting Type	778
	2. Acrylic Plastic Type	779
	(f) Fiberglass Reinforced Plastic Sign Panels	780
	1. Mechanical Properties	780
	2. Physical Properties	781
	a. Thickness	781
	b. Length and Width	781
	(1) Panel Length of 3660 mm (144 in.) or Less	781
	(2) Panel Length Exceeding 3660 mm (144 in.)	781
	(3) Panel Width of 3660 mm (144 in.) or Less	781
	c. Squareness	781
	d. Weather Resistance	781
	e. Fire Resistance	781
	f. Impact Resistance	781
	g. Coefficient of Linear Thermal Expansion	782
	h. Panel Smoothness	782
	i. Flatness	782
	(1) Test Purpose	782
	(2) Test Procedure	782
	j. Color	782
	(g) Samples and Tests	782
	1. Reflective Sheeting	782
	2. Traffic Signal Materials	782
913.11	Highway Illumination Materials	783
	(a) Lighting Standards and Mast Arms, under 80 feet (24.4 m)	783
	1. General Requirements	783
	2. Aluminum Lighting Standards	785
	a. Round Seamless	785
	b. Single Longitudinal Welded	785
	3. Stainless Steel Lighting Standards	785
	4. Galvanized Steel Lighting Standards	786
	5. Wood Pole Lighting Standards	786

TABLE OF CONTENTS

Section	Title	Page
	6. Frangible Breakaway Bases	786
	a. Cast Aluminum Transformer Base.....	786
	b. Breakaway Coupling	787
	7. Anchor Bolts	787
	(b) High Mast Standards of 24.5 m (80 ft) and Over.....	787
	1. High Mast Poles.....	787
	2. Welding.....	788
	3. Handholes	788
	4. Luminaire Ring Assembly	788
	5. Head Frame Assembly.....	789
	6. Winch Assembly	789
	7. External Drive System	790
	8. Cable Terminator	790
	9. Lightning Rod Assembly and Grounding System.....	790
	10. Anchor Bolts.....	791
	(c) Wire and Cable.....	791
	1. Polyethylene Conduit	791
	2. Conductors in Cable-Duct.....	791
	3. Lighting Standard Circuit Wiring.....	792
	4. Sign and Underpass Wiring	792
	5. Aerial Cable.....	792
	6. High Mast Tower Luminaire Ring Conductors	792
	7. Power Cable-High Mast Poles	792
	8. Electrical Connectors.....	792
	(d) Luminaires	793
	1. General Requirements.....	793
	2. Roadway Lighting Luminaires	793
	3. Sign Luminaires	793
	4. Underpass Luminaires	793
	5. High Mast Luminaires	794
	(e) Circuit Breakers and Enclosure	794
	1. Circuit Breakers for Type II Service Point.....	794
	2. Circuit Breakers for Sign and Underpass Circuits	794
	3. Circuit Breakers for High Mast Poles.....	794
	4. E-Series Magnetic Circuit Breakers	794
	(f) Multiple Relay Switches with Photocell Receptacles.....	795
	(g) Shop Drawings.....	795
	(h) Materials Certification.....	796
913.12	Construction Warning Lights.....	796
	(a) Types of Warning Lights	796
	1. Type A	796
	2. Type B	796
	3. Type C	796
	(b) General Requirements	796
	(c) Flash Requirements	796
	1. Flash Rate	796
	2. On-Time	796
	a. Definition.....	796
	b. Type A	797
	c. Type B.....	797
	(d) Optical Requirements	797
	1. Effective Intensity.....	797
	2. Lens Illumination	797
	3. Reflex-Reflective Performance.....	797
	4. Testing Procedure.....	797

TABLE OF CONTENTS

Section	Title	Page
	(e) Lens Requirements	797
	1. Size of Lens	798
	2. Number of Lenses	798
	3. Lens Chromaticity	798
	4. Lens Luminous Transmittance	798
	5. Lens Material	798
	(f) Head and Housing	798
	1. Swivel Head	798
	2. Housing	798
	3. Weatherproofing	798
	(g) Photoelectric Controls	799
	(h) Basis For Use	799
913.13	Flashing Arrow Sign	799
913.14	Pavement Marking Material	800
	(a) Traffic Paint	800
	(b) Durable Marking Material	800
	1. Thermoplastic	800
	a. Material Requirements	801
	(1) Reflectorization	801
	(2) Set Time	801
	(3) Water Absorption	802
	(4) Softening Point	802
	(5) Specific Gravity	802
	(6) Impact Resistance	802
	(7) Low Temperature Stress Resistance	802
	(8) Bond Strength	802
	(9) Hardness	802
	b. Packaging	802
	c. Basis for Use	803
	2. Preformed Plastic	803
	a. Material Requirements	803
	(1) Tensile Strength	803
	(2) Adhesive Stability Test	803
	(3) Adhesive Shear Strength	804
	(4) Bend Test	804
	b. Packaging	804
	c. Basis For Use	804
	3. 100 Percent Solids Epoxy	804
	a. Material Requirements	805
	(1) Glass Beads	805
	(2) Abrasion Resistance	805
	(3) Hardness	805
	(4) Tensile Strength	805
	(5) Compressive Strength	805
	(6) Weather Resistance	805
	(7) Laboratory Drying Time	806
	(8) Viscosity	806
	b. Materials Preparation	806
	c. Packaging and Storage	806
	d. Basis For Use	806
	(c) Temporary Pavement Marking Tape	807
	(d) Raised Pavement Marker	807
	1. Snowplowable Raised Pavement Marker	808

TABLE OF CONTENTS

Section	Title	Page
	a. Prismatic Reflector.....	808
	(1) Optical Performance.....	808
	(2) Seal Test.....	809
	(3) Heat Resistance Test.....	809
	(4) Strength Test.....	809
	(5) Impact Test.....	809
	(6) Temperature Cycling Test.....	810
	(7) Adhesive Tensile Strength Test.....	810
	(8) Basis for Use.....	810
	b. Cast Metal Base.....	810
	(1) Epoxy Adhesive.....	811
	(2) Basis for Use.....	811
	c. Precast Cement Concrete Base.....	811
	(1) Adhesive for Precast Concrete Base.....	811
	(2) Packaging.....	811
	(3) Basis for Use.....	812
	2. Temporary Raised Pavement Marker.....	812
	a. Optical Requirements.....	812
	b. Strength Requirements.....	813
	c. Adhesive.....	813
	d. Acceptance Evaluation.....	814
	e. Basis for Use.....	815
913.15	Traffic Signal Materials and Equipment.....	815
	(a) Traffic Signal Controller and Cabinet.....	815
	1. Model Approval.....	815
	2. Controllers or Control Units Furnished and Installed by the Contractor.....	815
	3. Blank.....	816
	4. Bench Testing.....	816
	5. Pretimed Solid State Digital Controller.....	816
	a. General.....	817
	b. Controller Requirements.....	818
	c. Spare Modules.....	821
	d. Controller Enclosure.....	821
	e. Power Requirements.....	821
	f. Certification of Traffic Control Units.....	821
	g. Warranty.....	821
	6. Traffic Actuated Solid State Digital Controller.....	821
	a. General.....	821
	b. Controller Requirements.....	822
	c. Spare Modules.....	823
	d. Controller Enclosure.....	823
	e. Power Requirements.....	823
	f. Certification of Traffic Control Units.....	823
	(1) Certification of a Production Run Model.....	823
	(2) Certification of Environmental Testing.....	824
	g. Warranty.....	824
	7. Cabinet Requirements for Traffic Signal Controllers.....	825
	a. General.....	825
	b. G Cabinet.....	827
	(1) Cast Aluminum Pedestal Base.....	827
	(2) Pedestal Pole.....	828
	(3) Pole Cap.....	829
	c. M Cabinet.....	829
	d. P-1 Cabinet.....	831

TABLE OF CONTENTS

Section	Title	Page
8.	Two Circuit Alternating Flasher	831
a.	General	831
b.	Cabinet Requirements	832
(b)	Interconnection Equipment	832
1.	Hardwire Interconnection	832
a.	Electro-Mechanical Dial Coordination Unit	833
(1)	General	833
(2)	Additional Requirements for Master Locations	833
(3)	Additional Requirements for Secondary Locations	834
(c)	Blank	834
(d)	Signal Head Components	834
1.	Vehicle Signal Face	834
a.	General	834
b.	Housing, Door, and Visor	834
c.	Lens	834
d.	Reflector Assembly	834
e.	Lamp Receptacle and Wiring	835
f.	Section Coupling	835
g.	Terminal Block	835
h.	Material Requirements	835
(1)	Polycarbonate Signal Head	835
(2)	Die-Cast Aluminum Signal Head	836
i.	Certification	836
2.	Pedestrian Signal Head	836
a.	Housing, Door, and Visor	836
b.	Optical Unit	837
c.	Lens	837
d.	Message	837
e.	Reflector Assembly	837
f.	Light Distribution	837
g.	Electrical	837
3.	Disconnect Hanger Junction Box	838
4.	Signal Bulbs	839
5.	Free Swinging Signal Support Assemblies	840
6.	Mid-Mast Arm Mount Signal Bracket	840
7.	Pedestal Mounted Control Cabinets or Pedestrian Signal Heads	841
(e)	Signal Support	841
1.	Steel Strain Pole	841
a.	Maximum Load 35.6 kN (8000 lbs)	842
2.	Wood Strain Pole	842
3.	Signal Cantilever Structures	843
a.	General	843
b.	Signal Support	843
c.	Combination Signal-Luminaire Support	843
d.	Pole Requirements	844
(1)	General	844
(2)	Deflection	844
(3)	Materials	844
(4)	Hardware	844
(5)	Anchor Base	844
e.	Arm Requirements	845
(1)	Signal Cantilever Arm	845
(2)	Luminaire Mast Arm for Combination Support	845
(3)	Materials	845
f.	Anchor Bolts	845

TABLE OF CONTENTS

Section	Title	Page
	g. Finish.....	846
	h. Certification.....	846
	i. Shop Drawings.....	846
	4. Downguys, Anchors, Rods, and Guards.....	846
(f)	Messenger Cable.....	846
	1. Messenger Cable.....	846
	2. Span, Catenary, and Downguy Cable.....	846
	3. Tether and Support Cable.....	847
	4. Cable Hardware.....	847
	a. Messenger Hangers.....	847
	b. Cable Ring.....	847
	c. Clamps.....	847
	d. Servi-Sleeves.....	847
	e. Straight Eye-Bolts.....	847
	f. Hub-Eyes.....	848
	5. Signal Cable.....	848
	a. Hook-up Wire.....	848
	b. Signal Control Cable.....	848
	c. Integral Messenger Interconnect Cable.....	848
	d. 6 Pair/19 Telemetry Cable.....	848
	e. Fiber Optic Interconnect Cable.....	848
	f. Service Cable.....	848
	g. Detection Wire and Sealant.....	848
	(1) Loop Detector Lead-in Cable.....	849
	(2) Roadway Loop Wire.....	849
	(3) Sealant.....	849
	h. Ground Wire.....	849
	i. Splicing Kit.....	849
(g)	Ground Rod and Connections.....	849
(h)	Castings for Handholes.....	850
(i)	Entrance Switch.....	850
(j)	Conduit and Fittings.....	850
	1. Steel Conduit.....	850
	2. Polyvinyl Chloride Conduit.....	850
(k)	Detector Housing.....	850
(l)	Certification.....	851
913.16	Fabric for Waterproofing.....	851
913.17	Packaged, Dry, Combined Materials for Mortar and Concrete.....	851
913.18	Geotextile for Use Under Riprap.....	851
913.19	Geotextile for Use with Underdrains.....	852
913.20	Geotextile for Silt Fence.....	854
913.21	Geogrid for Stabilization or Modification.....	854
914	ROADSIDE DEVELOPMENT MATERIALS.....	855
914.01	Special Topsoil for Roadside Development.....	855
914.02	Blank.....	856
914.03	Fertilizer.....	856
914.04	Grass and Legume Seed.....	856
914.05	Mulch.....	860
	(a) Mulch for Seeding.....	860
	1. Excelsior Mulch.....	860
	2. Wood Cellulose Fiber.....	861
	3. Excelsior Blanket.....	861
	4. Paper Mat.....	861
	5. Straw Mat.....	861
	(b) Mulch for Plants.....	861

TABLE OF CONTENTS

Section	Title	Page
914.06	Leguminous Inoculants	862
914.07	Sod	862
914.08	Plant Materials	862
	(a) Quality of Plant Materials	862
	(b) Plant Names	863
	(c) Substitutions	863
	(d) Grading Standards	863
	(e) Nursery Inspection and Plant Quarantine	863
	(f) Balled and Burlapped Plants	863
	(g) Container Grown Plants	863
	(h) Bare Rooted Plants	864
	(i) Collected Plants.....	864
	(j) Forms, Shapes, and Condition of Plants	864
	(k) Inspection	864
	(l) Shipment	865
	(m) Certification.....	865
914.09	Miscellaneous Material.....	865
	(a) Water.....	865
	(b) Stakes for Bracing and Anchoring.....	865
	(c) Tree Wound Dressing.....	865
	(d) Porous Material	865
	(e) Pipe.....	866
	(f) Staples.....	866
	(g) Plastic Net.....	866
915	BRIDGE PILES AND BEARINGS.....	866
915.01	Steel Shell Encased Concrete Piles and Epoxy Coated Steel Shell Encased Reinforced Concrete Piles	866
	(a) General Requirements	866
	(b) Fluted Steel Pile Shells	867
	(c) Rounded Steel Pipe Shells.....	867
	(d) Epoxy Coating for Piles	867
	1. Prequalification of Organic Coatings for Steel Piles	867
	a. Product Data Sheet.....	867
	b. Fingerprint	868
	c. Materials Safety Data Sheets.....	868
	d. Laboratory Report	868
	(1) Tensile Strength and Elongation.....	868
	(2) Impact Resistance	868
	(3) Abrasion Resistance	868
	(4) Salt Fog	868
	2. Application.....	868
	a. Surface Preparation	868
	b. Coating Application	868
	(1) Thickness	869
	(2) Cure.....	869
	(3) Continuity of Coating	869
	3. Certification.....	869
915.02	Steel H Piles and Epoxy Coated Steel H Piles	869
915.03	Wood Piles.....	869
915.04	Elastomeric Bearings.....	869
	(a) Description.....	869
	(b) Materials	870
	(c) Manufacturing Requirements.....	871
	(d) Appearance and Dimensions	872
	(e) Quality Assurance	872
	(f) Certification.....	873

TABLE OF CONTENTS

Section	Title	Page
916	MATERIALS CERTIFICATIONS	873
916.01	General	873
916.02	Types of Certifications	873
	(a) Type A.....	873
	(b) Type B.....	873
	(c) Type C.....	874
	(d) Type D.....	874
	(e) Other Types.....	874
	(f) Requirements for Small Quantities of Materials.....	874
	(g) Buy American Requirement	874
916.03	Sample Forms	874
	(a) For Buy American Requirement.....	874
	(b) Sample Type A Certification Form	875
	(c) Sample Type B Certification Form.....	876
	(d) Sample Type C Certification Form	877
	(e) Sample Type D Certification Form	877
	(f) Sample Asbestos Exclusion Letter	878
917	QUALITY ASSURANCE AGGREGATE CERTIFICATION	879
917.01	General Requirements	879
917.02	Quality Control Plan	879
917.03	Source Approval Requirements	879
	(a) Step 1.....	879
	(b) Step 2	880
	(c) Step 3.....	880
917.04	Removal from Certified Producer Status.....	880
917.05	Appeals	880