WEST VIRGINIA
DIVISION OF HIGHWAYS

SUPPLEMENTAL SPECIFICATIONS

TO ACCOMPANY THE 2000 EDITION OF
THE STANDARD SPECIFICATIONS
Roads and Bridges

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TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE #
	DIVISION 100	
102	**BIDDING REQUIREMENTS AND CONDITIONS**	**1**
102.7	Irregular Proposals	1
102.15	Free Competitive Bidding Affidavit	1
103	**AWARD AND EXECUTION OF CONTRACT**	**1**
103.1	Consideration of Proposals	1
103.5	Requirement of Contract Bond	2
103.6.1	Contractor's General Liability Insurance	3
103.6.2	Employer's Liability Insurance	3
103.6.5	Countersignature of West Virginia Agent	4
105	**CONTROL OF WORK**	4
105.2	Plans and Working Drawings	4
105.11	Inspection of the Work	4
106	**CONTROL OF MATERIALS**	5
106.1	Source of Supply and Quality Requirements	5
106.1.1.1	Definitions	5
106.1.1.2	Preference for Domestic Aluminum and Glass Products	5
106.1.1.4	Procedures for Use of Foreign-Made Materials	6
106.1.1.5	Use of Domestic Steel Products	6
106.1.1.6	Domestic Steel Products	6
107	**LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC**	**7**
107.8	Railway-Highway Provisions	7
107.8.2.1	Contractor's Public Liability Insurance and Protective Public Liability Insurance	7
107.8.2.2.1	Railroad Protective Liability Insurance Limits for Non-Passenger Railway Facilities	7
107.8.2.2	Railroad Protective Liability	7
107.8.2.2.2	Railroad Protective Liability Insurance Limits For Passenger Railway Facilities	8
107.26	Notification of Abatement, Demolition or Renovation	8
107.26.1	Abatement	8
107.26.2	Demolition	8
107.26.2.1	Asbestos Containing Materials Reported	8
107.26.2.2	No Asbestos Containing Materials Reported	8
107.26.3	Renovation	9
107.26.3.1	Asbestos Containing Materials Reported	9

SECTION	DESCRIPTION	PAGE #
107.26.3.2	No Asbestos Containing Materials Reported	9
107.26.4	Notifications	9
107.27	Construction Access and Environmental Permits	9
107.27.1	Temporary Construction Accesses	10
107.27.1.1	Changing Temporary Construction Accesses	10
107.27.1.2	Excavated Material	10
107.27.2	Corps of Engineers Permit	10
108	**PROSECUTION AND PROGRESS**	**11**
108.1	Subletting of Contract	11
108.1.1	Subletting of Contract Materials	12
108.2	Notice To Proceed	12
108.3	Prosecution of the Work	12
108.3.1	General	12
108.3.1.1	Submission of Construction Schedules	14
108.3.1.2	Preliminary Construction Schedule	14
108.3.1.3	Detailed Construction Schedule	14
108.3.1.4	Construction Schedule Requirements	14
108.3.2	Critical Path Method (CPM) Schedule	15
108.3.3	Activities Schedule Chart (ASC) Schedule	16
108.3.4	Progress Reporting and Schedule Updating	16
108.3.5	Submission of Revised Construction Schedule	18
108.4	Limitation of Operations	18
108.5	Character of Workers; Methods and Equipment	18
108.6	Determination and Extension of Contract Time	19
108.6.1	General	19
108.6.2	Extension of Contract Time	20
108.6.2.1	Excusable Noncompensable Delays	21
108.6.2.2	Excusable Compensable Delays	23
108.7	Completion Dates	24
108.7.1	Failure to Complete On Time and Liquidated Damages	24
108.7.2	Interim Completion Date	25
108.7.3	Incentive/Disincentive for Early Completion	25
108.8	Default and Termination of Contract	25
108.9	Termination of Contract for Convenience of the State	26
108.10	Field Office Overhead	29
108.11	Home Office Overhead	29
108.11.1	Home Office Overhead Rate	30
109	**MEASUREMENT AND PAYMENT**	**31**
109.1	Measurement of Quantities	31

SECTION	DESCRIPTION	PAGE #
109.6	Partial Payments	31
109.9	Price Adjustment of Fuel Oil No. 2 (Diesel Fuel)	32
109.10	Price Adjustment of Asphalt Cement	34
109.20	Load Limit Violations and Weigh Tickets	36
110 MISCELLANEOUS PROVISIONS		**37**
110.2	Minimum Wage Determinations	37

DIVISION 200

202 BUILDING DEMOLITION, WELL AND SEPTIC TANK ABANDONMENT		**38**
202.1	Description	38
202.2	Utilities	38
202.3	Disposal of Materials	38
202.4	Buildings	39
202.4.1	Rodent Control	39
202.4.1.1	General	39
202.4.1.2	Materials	39
202.4.1.3	Rodent Control Operations	40
202.4.2	Insurance Requirements	41
202.5	Wells	41
202.5.1	Materials	41
202.5.2	Gas and Oil Wells	41
202.5.3	Water Wells	41
202.6	Septic Tanks	42
202.7	Method of Measurement	42
202.10	Basis of Payment	42
202.11	Pay Items	42
204 MOBILIZATION		**43**
204.4	Method of Measurement	43
204.5	Basis of Payment	43
		43
206 BASE COURSE REINFORCEMENT GEOGRID		**43**
206.1	Description	43
206.2	Reference Documents	44
206.3	Geogrid Material	44
206.3.1	General	44
206.3.2	Certification of Materials and Submittals	44
206.3.2.1	Specification Compliance Certification	44
206.3.2.2	Fitness for Use	44
206.3.3	Base Course Reinforcement Geogrid	44
206.3.4	Alternate Material	46
206.4	Manufacturing Quality Control	46

SECTION	DESCRIPTION	PAGE #
206.5	Transportation, Handling and Storage	47
206.6	Construction	48
206.7	Measurement/Payment	48
206.8	Pay Items	49
207	**EXCAVATION AND EMBANKMENT**	**49**
207.6.3	Waste	49
211	**BORROW EXCAVATION**	**50**
211.2.4	Impervious Core	50
211.3	General	50
211.3.1	Impervious Core	50
211.7.4	Square Foot (Meter) Measurement	51
211.9	Pay Items	51
212	**STRUCTURE, ROCK, AND WET EXCAVATION**	**52**
212.2	Materials	52
219	**CONTROLLED LOW STRENGTH MATERIAL**	**52**
219.3	Properties	52
219.4.1	Proportioning	52
219.4.2	Testing	53

DIVISION 300

307	**CRUSHED AGGREGATE BASE COURSE**	**53**
307.1	Description	53
307.2	Materials	53
307.2.1	Quality Control Testing	54
307.2.2	Acceptance Testing	54
307.2.3	Sampling and Testing	54
307.2.4	Acceptance Procedure	54
307.2.4.1	Acceptance Plan	54
307.2.4.1.1	For Compaction	54
307.2.4.1.2	For Gradation	55
307.2.4.2	Degree of Nonconformance	55
307.3	Equipment	56
307.4	Placing	56
307.5	Compacting	57
307.6	Tolerance	57
307.6.1	Surface Tolerance	57
307.6.2	Thickness Tolerance	57
307.7	Maintenance	57
307.8	Method of Measurement	58
307.8.1	Cubic Yard (Meter) Measurement	58
307.8.2	Ton (MG) Measurement	58
307.9	Basis of Payment	59
307.9.1	Price Adjustment	59

SECTION	DESCRIPTION	PAGE #
307.10	Pay Items	59
311	**OPEN GRADED FREE DRAINING BASE COURSE**	**59**
311.5	Testing	59
311.5.1	Quality Control Testing	60
311.5.2	Acceptance Testing	60
311.6	Weather and Seasonal Limitations	60
311.7	Equipment	60
311.8	Preparation and Batching of Materials	60
311.9	Mixing and Transporting Requirements	61
311.12	Tolerance	61
314	**AGGREGATE SUBBASE**	**61**

DIVISION 400

401	**HOT-MIX ASPHALT BASE, WEARING, AND PATCHING-AND-LEVELING COURSES**	**61**
401.1	Description	61
401.2	Materials	62
401.3	General	62
401.4	Composition of Mixtures	63
401.4.1	General	63
401.4.2	Job Mix Formula	63
401.5	Testing	65
401.5.1	Test Methods	65
401.6	Contractors Quality Control	66
401.6.1	Quality Control Testing	66
401.6.2	Job Mix Formula Field Verification	67
401.6.3	Quality Control Testing Requirements	67
401.7	Acceptance Testing	67
401.7.1	Acceptance Testing of HMA	67
401.7.2	Surface Tolerance	67
401.7.3	Compaction	68
401.7.3.1	LOT-By-LOT Testing	70
401.7.3.2	Shoulders With Rolled-In Rumble Strips	70
401.7.4	Thickness	70
401.8	Weather Restrictions	71
401.8.1	Cold Weather Paving	72
401.9	Equipment	72
401.9.1	Plants	72
401.9.2	Dust Collector	73
401.9.3	Truck Scales	73
401.9.4	Test Weights	73
401.9.5	Surge and Storage Bins	73
401.9.6	Inspection of Equipment and Plant Operations	74

SECTION	DESCRIPTION	PAGE #
401.9.7	Trucks for Transporting Mixture	74
401.9.8	Laboratory	75
401.9.9	Spreading Equipment	76
401.9.10	Compaction Equipment	76
401.10	Paving Operations	76
401.10.1	Cleaning and Sweeping	76
401.10.2	Patching and Leveling and Scratch Courses	76
401.10.2.1	Patching and Leveling	76
401.10.2.2	Scratch Course	77
401.10.3	Spreading and Finishing	77
401.10.4	Rolling Procedure	78
401.10.5	Joints	79
401.11	Protection of Pavement and Traffic Control	79
401.11.1	Interim Traffic Control for Two-Lane, Two-Way Roadways	80
401.11.1.1	Temporary Pavement Markings for two-way, two-lane roadways	80
401.11.1.1.1	AADT equal to or > 3,000	80
401.11.1.1.2	AADT < 3,000	80
401.11.2	Interim Traffic Control for One-Way Multilane Roadways	80
401.11.2.1	Temporary Pavement Markings	80
401.11.3	Interim Traffic Control for Two-Way Three-Lane Roadways	81
401.11.3.1	Temporary Pavement Markings	81
401.11.4	Interim Traffic Control for Two-Way Four-Lane and Five-Lane Roadways	81
401.11.4.1	Temporary Pavement Markings	81
401.11.5	Seasonal Temporary Markings	82
401.12	Method of Measurement	82
401.13	Basis of Payment	82
401.14	Pay Items	84
402	**HOT-MIX ASPHALT SKID RESISTANT PAVEMENT**	**84**
402.1	Description	84
402.2	Materials	84
402.2.1	Marshall Mix Designs	85
402.2.2	Superpave Mix Designs	85
402.3	Fine Aggregate	85
402.3.1	Marshall Mix Designs	85
402.3.2	Superpave Mix Designs	85
402.4	Mixing	85
402.5	Pay Items	85
405	**SURFACE TREATMENTS**	**85**
405.2	Materials	86

SECTION		DESCRIPTION	PAGE #
	405.2.1	Quality Control Testing	86
	405.2.2	Acceptance Testing	86
	405.2.3	Acceptance for the Grading of Coarse Aggregate	86
	405.2.3.1	Degree of Nonconformance	87
	405.2.3.2	Price Adjustment	87
	405.3	Weather Restrictions	88
	405.4	Equipment	88
	405.6	Cleaning and Sweeping	89
	405.11	Protection of Pavement and Traffic Control	89
	405.13	Method of Measurement	90
	405.15	Pay Items	90
408	**TACK COAT**		**90**
	408.2	Materials	90
	408.2.1	Quality Control Testing	91
	408.2.1.1	Acceptance Testing	91
	408.2.2	Acceptance Procedure	91
	408.3	Weather Restrictions	91
	408.4	Equipment	91
	408.6	Cleaning and Sweeping	91
	408.7	Applications of Bituminous Material	91
			91

DIVISION 500

501	**PORTLAND CEMENT CONCRETE PAVEMENT**		**92**
	501.4.1	Test Methods	92
	501.7	Handling, Measuring, and Batching Materials	92
506	**CONCRETE PAVEMENT REPAIR**		**93**
	506.1	Description	93
	506.2	Materials	93
	506.3	Proportioning	93
	506.4	Testing	93
	506.5	Conditioning Existing Subbase	93
	506.6	Placing Concrete	94
	506.7	Curing	94
	506.8	Ride Acceptance	94
	506.9	Method of Measurement	94
	506.10	Basis of Payment	95
	506.11	Pay Item	95

DIVISION 600

601	**STRUCTURAL CONCRETE**		**95**
	601.1	Description	96

SECTION	DESCRIPTION	PAGE #
601.2	Materials	96
601.3	Proportioning	100
601.3.2.1	Consistency	100
601.3.2.2	Air Content	101
601.3.2.4	Total Solids Ā	101
601.4.1	Sampling and Testing Methods	102
601.4.2	Contractor's Quality Control	103
601.4.4	Compressive Strength Tests for Acceptance	103
601.4.5	Tests for Permeability Acceptance	104
601.5	Equipment and Tools	104
601.5.4	Recording Thermometer	104
601.6	Handling, Measuring, and Batching of Materials	105
601.7	Mixing	105
601.8	Forms	106
601.8.1	General	106
601.8.9	Stay-In-Place Fabricated Metal Forms for Concrete Bridge Decks	106
601.8.9.1	General	106
601.8.9.2	Material	106
601.8.9.3	Installation	107
601.8.9.4	Placement of Concrete	107
601.8.9.5	Inspection	107
601.8.9.6	Forming System Changes	108
601.8.10	Architectural Formwork	108
601.8.10.1	General	109
601.8.10.2	Submittals	109
601.8.10.3	Quality Assurance	109
601.8.10.4	Materials	110
601.8.10.4.1	Form Materials	110
601.8.10.4.2	Formwork Design	110
601.8.10.5	Construction Methods	110
601.8.10.5.1	Form Construction	110
601.8.10.5.2	Form Coatings	111
601.8.10.5.3	Reusing Forms	111
601.9.1	Cold Weather Concreting	111
601.10	Placing Concrete	111
601.10.1	General	111
601.10.1.1	Pre-Pour Meeting	112
601.10.1.3	Concrete Placement Limitations	112
601.10.1.4	Concrete Placement at Night	113
601.10.3	Vibrating	113
601.10.4	Placing Concrete Bridge Decks	113
601.10.4.1	Fogging Equipment	113

SECTION	DESCRIPTION	PAGE #
601.10.4.2	Placement	113
601.11	Finishing Concrete Surfaces	114
601.11.4	Finishing Concrete Bridge Decks	114
601.11.4.1	Class H Bridge Decks	114
601.11.5	Finishing Concrete Decks for the Placement of Specialized Overlay	115
601.12	Curing and Protecting Concrete	116
601.12.1	Curing Under Normal Conditions	116
601.12.2	Curing Under Cold Weather Conditions	116
601.12.4	Curing Class H Concrete	116
601.13	Protective Surface Treatment	117
601.13.1	Linseed Oil	117
601.13.3	Concrete Protective Coatings	117
601.13.3.1	Concrete Surface Preparation	117
601.13.3.2	Concrete Protective Coating Materials	118
601.14	Method of Measurement	120
601.15	Basis of Payment	120
601.15.2	Price Adjustments	121
601.16	Pay Items	121
602	**REINFORCING STEEL**	**122**
602.9	Method of Measurement	122
603	**PRESTRESSED CONCRETE MEMBERS**	**122**
603.2.1	Materials Details	122
603.4.2	Shop Drawings	123
603.6.2	Shop Drawings	123
603.6.4	Sampling and Testing Methods	123
603.6.5	Strength of Concrete	124
603.9	Finishing	124
604	**PIPE CULVERTS**	**124**
604.2	Materials	124
604.2.1	Quality Control Testing	125
604.14	Pay Items	125
606	**UNDERDRAINS**	**127**
606.2	Materials	127
606.2.1	Quality Control Testing	127
606.2.2	Acceptance Testing	127
607	**GUARDRAIL**	**127**
607.1	Description	127
607.2	Materials	127
607.6	Method of Measurement	128
607.6.1	Tangent End Terminal Components	128
607.6.2	Flared End Terminal Components	132
607.7	Basis of Payment	137
607.8	Pay Items	137

SECTION	DESCRIPTION	PAGE #
609 SIDEWALKS		**137**
609.1	Description	137
609.2	Detectable Warning Surfaces	138
609.2.1	Approved Products Listing	138
609.3	Subgrade Preparation	138
609.4	Dry Bed	138
609.5	Forms	139
609.6	Mixing and Placing Concrete	139
609.7	Expansion Joints	139
609.8	Finishing	139
609.8.1	Concrete	139
609.8.2	Detectable Warning Surface	140
609.9	Curing	140
609.10	Method of Measurement	140
609.11	Basis of Payment	140
609.12	Pay Items	141
612 TUNNEL LINER PLATE PIPE		**141**
612.9	Pay Items	141
615 STEEL STRUCTURES		**141**
615.1.3	Inspection	141
615.2.1	Shop Drawings	141
615.3.3	Welded Stud Shear Connectors	142
616 PILING		**142**
616.1	Description	142
616.2	Materials	142
616.3	Preparation for Driving	143
616.3.1	General	143
616.3.2	Caps	143
616.4	Equipment for Driving	143
616.4.1	General	143
616.4.2	Hammers for Steel Piles	143
616.4.3	Hammers for Concrete Piles	144
616.4.4	Leads	144
616.4.5	Water Jets	144
616.5	Method of Driving	144
616.6	Accuracy of Driving	144
616.6.1	Foundations	145
616.6.2	Abutments with Single Lines of Piles	145
616.6.3	Combination Pile and Trestle Bents	145
616.7	Defective Piles	145
616.8	Determination of Bearing Values	145
616.8.1	Loading Tests	145
616.8.2	From Blow Count at Refusal	145
616.9	Precast Concrete Piles	145

SECTION	DESCRIPTION	PAGE #
616.9.1	General	145
616.9.2	Formwork	146
616.9.3	Placing and Finishing	146
616.9.4	Curing	146
616.9.5	Handling	146
616.10	Prestressed Concrete Piles	146
616.11	Steel Piling	147
616.11.1	General	147
616.11.2	Splicing Steel Piles	147
616.11.3	Cutting off Steel Piles	147
616.12	Predrilled Piling	147
616.13	Extensions or "Build-Ups"	147
616.14	Method of Measurement	148
616.15	Basis of Payment	148
616.16	Pay Items	148
625 DRILLED CAISSON FOUNDATIONS		**149**
625.1	Description	149
625.2	Tests and Submittals	149
625.2.1	Experience	149
625.2.2	Site Inspection	150
625.2.3	Installation Plan	150
625.2.4	As-Built Records	151
625.2.5	Test Hole	151
625.2.6	Nondestructive Testing	151
625.2.6.1	General Requirements	151
625.2.6.2	Preparation for Testing	152
625.2.6.3	CSL Logging Procedures	153
625.2.6.4	CSL Testing Results	153
625.2.6.5	Evaluation of CSL Test Results	153
625.2.6.6	Evaluation by Core Drilling	154
625.3	Dimensional Requirements	154
625.3.1	Placement Tolerances	154
625.3.2	Caisson Diameters	154
625.3.3	Bottom Excavation	154
625.3.4	Caisson Cutoff Elevations	154
625.3.5	Reinforcement	154
625.4	Materials	155
625.4.1	Concrete	155
625.4.2	Reinforcing Steel	155
625.4.3	Casing	155
625.4.4	CSL Testing Tubes	155
625.5	Construction	156
625.5.1	General	157
625.5.2	Excavation	157

SECTION	DESCRIPTION	PAGE #
625.5.2.1	Scope	157
625.5.2.2	Excavation through Overburden	157
625.5.2.3	Excavation in Rock	157
625.5.2.4	Providing for Socket Inspection	158
625.5.2.5	Disposal of Materials	158
625.5.2.6	River Area	158
625.5.2.7	Safety Measures	158
625.5.3	Reinforcing Steel Installation	159
625.5.4	Placement of Concrete	160
625.5.5	Removal of Casing	161
625.6	Inspection of Sockets	162
625.6.1	Depth of Rock Socket	162
625.6.2	Inspection Under Water	162
625.7	Method of Measurement	162
625.8	Basis of Payment	163
625.9	Pay Items	163
626 RETAINING WALL SYSTEMS		**164**
626.1	Description	164
626.2	General	164
626.3	Design Criteria	164
626.3.1	General	164
626.3.2	Mechanically Stabilized Earth	165
626.3.3	Cast-in-Place Reinforced Concrete	165
626.4	Submittals	165
626.4.1	General	165
626.4.2	Mechanically Stabilized Earth	167
626.4.3	Cast-in-Place Reinforced Concrete	167
626.5	Materials	167
626.5.1	Mechanically Stabilized Earth Components	167
626.5.1.1	Facing Elements	167
626.5.1.1.1	Reinforced Concrete Facing Elements	167
626.5.1.1.2	Modular Block Facings	168
626.5.1.1.2.1	Mix Design	169
626.5.1.1.2.2	Modular Block Production	170
626.5.1.1.2.3	Sealing	171
626.5.1.1.3	Wire Facings	172
626.5.1.2	Soil Reinforcing and Attachment Devices	172
626.5.1.2.1	Metal Soil Reinforcing or Attachment Devices	172
626.5.1.2.2	Geosynthetics Soil Reinforcing or Attachment Devices	173
626.5.1.3	Joint Materials	177
626.5.1.4	Acceptance	178
626.5.2	Concrete Leveling Pad	178

SECTION	DESCRIPTION	PAGE #
626.5.3	Select Granular Backfill	178
626.5.3.1	Test Requirements	178
626.5.3.2	Quality Control Testing	178
626.5.3.3	Sampling and Testing	178
626.5.3.4	Acceptance	179
626.6	Construction Methods	179
626.6.1	Mechanically Stabilized Earth	179
626.6.1.1	Foundation Preparation	179
626.6.1.2	Wall Erection	180
626.6.1.3	Backfill Placement	180
626.6.2	Cast-in-Place Reinforced Concrete	181
626.6.2.1	General	181
626.6.2.2	Architectural Forms	181
626.6.2.2.1	General	181
626.6.2.2.2	Form Coatings	182
626.6.2.2.3	Reusing Forms	182
626.7	Method of Measurement	182
626.7.1	General	182
626.7.2	Mechanically Stabilized Earth	183
626.7.3	Cast-in-Place Reinforced Concrete	183
626.8	Basis of Payment	183
626.9	Pay Items	183
636	**MAINTAINING TRAFFIC**	**184**
636.2	Materials	184
636.9	Traffic Control Devices	184
636.11	Flagger - Traffic Director	184
636.19	Portable Message Signs	185
636.19.1	General	185
636.19.2	Display	185
636.19.3	Sign Types	186
636.19.3.1	Changeable Message Sign	186
636.19.3.2	Speed Monitoring Trailer	186
636.19.3.2.1	Radar	186
636.19.3.2.2	Display	186
636.19.4	Placement	187
636.23.6	Traffic Control Devices	187
636.23.22	Portable Message Sign	187
636.24	Basis of Payment	188
636.25	Pay Items	188
637	**WATER**	**188**
637.4	Method of Measurement	188
640	**FIELD OFFICE AND STORAGE BUILDING**	**188**
640.1	Description	188
640.2	Materials	188

SECTION	DESCRIPTION	PAGE #
640.3	Location and Time of Erection	188
640.4	Field Office	189
640.4.1	General	189
640.4.2	Large field office	189
640.4.3	Standard Field Office	190
640.4.4	Small Field Office	190
640.4.5	Minimal Field Office	190
640.5	Storage Building	190
640.6	Liability for Property in Office/Storage Structures	190
640.7	Maintenance	191
640.8	Removal	191
640.9	Alternate for Office Building	191
640.10	Equipment	191
640.11	Computer System for Field Office	192
640.12	Method of Measurement	193
640.13	Basis of Payment	193
640.14	Pay Items	193
642	**TEMPORARY POLLUTION CONTROL**	**194**
642.2	Materials	194
642.4	General Requirements	194
642.6	Temporary Pipe, Contour Ditches, Berms, Slope Drains, Ditch Checks and Silt Fence	194
642.6.1	Temporary Pipe	194
642.6.	Contour Ditches and Berms	195
642.6.3	Slope Drains	195
642.6.4	Ditch Checks	195
642.6.5	Silt Fence	195
642.7	Method of Measurement	196
642.9	Pay items	196
645	**REINFORCED SOIL SLOPES**	**197**
645.1	Description	197
645.2	Materials	197
645.2.1	Geosynthetics Soil Reinforcing	197
645.2.2	Backfill Material	201
645.3	Foundation Preparation	201
645.4	Geosynthetic Installation	202
645.5	Backfill Placement	202
645.6	Erosion Control Material Placement	202
645.7	Acceptance	202
645.8	Method of Measurement	203
645.9	Basis of Payment	203
645.10	Pay Items	203
651	**FURNISHING AND PLACING TOPSOIL**	**203**

SECTION	DESCRIPTION	PAGE #
651.2	Materials	203
652	**SEEDING AND MULCHING**	**204**
652.6.1	General	204
653	**VINE AND GROUND COVER PLANTING**	**204**
653.9	Pay Items	204
654	**TREE AND SHRUB PLANTING**	**204**
654.17	Pay Items	204
656	**SEEDLING PLANTING**	**205**
656.8	Pay Items	205
657	**ROADSIDE SIGN SUPPORTS**	**205**
657.2.2.9	Anchor Bolts	205
658	**OVERHEAD SIGN STRUCTURES**	**205**
658.2.2.1	Galvanized Steel	205
658.2.2.2	Weathering Steel	205
662	**ROADWAY LIGHTING**	**206**
662.2.13	Lighting Supports	206
662.2.13.1	Lighting Pole Type I, II, and III-Steel	206
662.2.13.1.1	General Description	206
662.2.13.1.5	Bases	206
662.2.13.1.6	Anchor Bolts	206
662.2.13.3	Lighting Pole Type V and VII – Aluminum	206
662.2.13.3.1	General Description	206
662.2.13.3.2	Pole Shaft	207
662.2.13.3.3	Luminaire Support Arm	207
662.2.13.3.5	Anchor Bolts	207
662.2.13.4	Lighting Pole Type X - Steel High Mast	207
662.2.13.4.1	General Description	207
663	**PAVEMENT MARKINGS**	**208**
663.3	Types of Pavement Markings	208
663.3.11	Yield Triangles	208
663.3.12	Handicapped Symbols	
663.3.13	Bicycle Symbols	208
663.5.4	Extruded Thermoplastic Pavement Markings	208
663.5.5	Preformed Traffic Markings	208
663.5.10	Glass Beads	208
663.8	Pay Items	209
664	**TRAFFIC SAFETY DEVICES**	**209**
664.2	Materials	209
664.3.1.1	Crash Cushion, Quad Guard Terminal Devices, Reusable Energy Absorbing Crash Terminal, and Trinity Attenuating Crash Cushion Devices	209
675	**SANITARY SEWERS**	**209**
675.2	Materials	209

SECTION	DESCRIPTION	PAGE #
679	**OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS**	**210**
679.1	Description	210
679.1.1	Other Work	210
679.1.2	Definitions	210
679.1.2.1	Specialized Concrete Overlay	210
679.1.2.2	Slab Reconstruction Concrete	210
679.1.2.3	Curing Hour	210
679.1.2.4	Curing Temperature	211
679.2	Materials	211
679.2.1	General	211
679.2.1.1	Fine Aggregate	211
679.2.1.2	Coarse Aggregate	211
679.2.1.3	Latex Admixture	211
679.2.1.4	Microsilica Admixture	211
679.2.1.5	Bonding Grout	211
679.2.1.6	Class K Concrete	211
679.2.1.7	Curing Materials	211
679.2.1.8	Replacement Bars	212
679.2.2	Specialized Concrete Mix Design and Testing	212
679.2.2.1	Latex Modified Concrete	212
679.2.2.2	Microsilica Concrete	213
679.2.2.3	Pre-Pour Meeting	214
679.2.2.4	Test Slab Requirements	214
679.2.3	Equipment	214
679.2.3.1	Cutting Equipment	215
679.2.3.1.1	Hydrodemolishing Equipment	215
679.2.3.1.2	Hydrodemolishing Equipment Demonstration	215
679.2.3.2	Blastcleaning Equipment	216
679.2.3.3	Proportioning and Mixing Equipment	216
679.2.3.3.1	Latex Modified Concrete	216
679.2.3.3.2	Microsilica Concrete	216
679.2.3.4	Mobile Mixer Units	216
679.2.3.5	Mobile Mixer Unit Testing	217
679.2.3.6	Placing and Finishing Equipment	217
679.2.3.7	Recording Thermometer	218
679.2.3.8	Compressors or Water Flushing Equipment	218
679.2.3.9	Saw Cutting Equipment	218
679.2.3.10	Fogging Equipment	218
679.3	Construction Methods	219
679.3.1	Removal of Existing Deck Surface	219
679.3.2	Removal of Newly Placed Deck Surface	219
679.3.3	Preparation of Surface	220
679.3.4	Structural Slab Wetting	221

SECTION	DESCRIPTION	PAGE #
679.3.5	Placement Preconditions	221
679.3.6	Placing, Finishing and Curing Slab Reconstruction Concrete	221
679.3.6.1	Slab Reconstruction Concrete Curing Requirements	222
679.3.6.2	Removal of Slab Reconstruction Concrete Surface	222
679.3.7	Placing and Finishing Specialized Concrete Overlay	222
679.3.7.1	General	222
679.3.7.2	Finishing Equipment	222
679.3.7.3	Placement	223
679.3.7.4	Surface Texturing	224
679.3.7.5	Curing	224
679.3.7.5.1	Curing Latex Modified Concrete	224
679.3.7.5.2	Curing Microsilica Concrete	224
679.4	Construction Limitations and Requirements	225
679.4.1	Stockpiling Aggregates	225
679.4.2	Storage and Handling of Cement	225
679.4.3	Vehicular and Equipment Restrictions	225
679.4.3.1	Vehicle Weight Limits	225
679.4.3.2	Runways	225
679.4.3.3	Reinforcing Steel Protection	225
679.4.3.4	Construction Loading Limitations During Curing	225
679.4.4	Concrete Placement Limitations	226
679.4. 5	Concrete Pavement at Night	228
679.4.6	Hot Weather Provisions	228
679.4.7	Cold Weather Provisions	228
679.4.8	External Heat Provisions	228
679.4.9	Defective or Damaged Concrete	228
679.5	Final Bridge Deck Finish	229
679.5.1	Straightedge Test	229
679.5.2	Finished Deck Grooving	229
679.6	Method of Measurement	229
679.6.1	General	229
679.7	Basis of Payment	230
679.7.1	Rideability Price Adjustments	230
679.8	Pay Items	230
688	**PAINTING STEEL STRUCTURES**	**231**
688.1	Description	231
688.2.7	Handling Steel Structures	231
688.3.2.1	Materials	232
688.3.2.5	Paint Application Requirements (Subsection	232

SECTION	DESCRIPTION	PAGE #
	under New Structures)	
688.3.3.1	Material	232
688.3.3.5	Coating Application (Subsection under Existing Structures)	232
689	**METALIZING STEEL**	**232**
689.4	Application of Metallic Coating	232
		232

DIVISION 700

702	**FINE AGGREGATE**	**233**
702.1	Fine Aggregate for Portland Cement	233
702.1.2	Deleterious Substances	233
703	**COARSE AGGREGATE**	**233**
703.1	Crushed Stone	233
703.3.1	Steel Slag	233
703.3.1.1	Wearing III (Sand Mix)	234
703.6	Acceptance Plan for Grading of Coarse Aggregate	235
703.6.1	Degree of Nonconformance	235
703.6.2	Basis of Payment	235
703.6.3	Price Adjustment	235
704	**STONE AND CRUSHED AGGREGATE**	**236**
704.5	Special Rock Fill	236
705	Temperature Conversion Factors Table	237
705.5	Performance Graded Binders	238
705.12	Polymer-Modified Cationic Emulisfied Asphalt	238
707	**CONCRETE ADMIXTURES, CURING AND COATING MATERIALS**	**238**
707.4.3	Microsilica Admixture	239
707.5	Latex Admixture	239
707.12	Concrete Sealer	239
707.12.1	General	239
707.12.2	Acceptance	240
707.13	Accelerating Admixtures for Concrete	240
707.13.1	Acceptance Requirements for Approval of Accelerators	240
707.13.2	Performance Requirements for Concrete Accelerators	240
707.13.3	Certification of Accelerating Admixtures	240
707.13.4	Additional Test Requirements for Accelerating Admixtures (Optional)	241
707.14	Water-Reducing and Accelerating Admixtures for Concrete	241

SECTION	DESCRIPTION	PAGE #
707.14.1	Acceptance Requirements for Approval of Water-Reducing and Accelerating Admixtures	241
707.14.2	Performance Requirements for Concrete Water-Reducing and Accelerating Admixtures	242
707.14.3	Certification of Water-Reducing and Accelerating Admixtures	242
707.14.4	Additional Test Requirements for Water-Reducing and Accelerating Admixtures (Optional)	242
707.15	Hydration Control Admixtures for Concrete	242
707.15.1	Acceptance Requirements for Approval of Hydration Control Admixtures	242
707.15.2	Performance Requirements for Concrete Hydration Control Admixtures	242
707.15.3	Certification of Hydration Control Admixtures	242
707.15.4	Additional Test Requirements for Hydration Control Admixtures (Optional)	242
708	**JOINT MATERIALS**	**243**
708.3	Joint Sealant, Hot-Poured for Concrete and Asphalt Pavements	243
709	**METALS**	**243**
709.3	Hook Expansion Bolts for Fastening Wire Mesh In Shotcrete Applications	243
709.8	High Strength Low Alloy Structural Metal	243
709.12	Structural and Eyebar Steel	243
709.15	Coated Dowel Bars & Dowel Basket Assemblies	244
709.45	Galvanized Steel Guardrail Posts	244
709.46	Steel Posts, Post Braces and Gate Frames for Right-of-Way Fence	244
711	**PAINTS, COATINGS, OILS, AND INKS**	**244**
711.6	Organic Zinc Primer	245
711.6.1	General	245
711.6.2	Vehicle	245
711.6.3	Physical Requirements	245
711.8	Field Primer-Slow Drying	246
711.8.2	Physical Requirements	246
711.11	Pigmented Finish Coat	246
711.11.1	General	246
711.11.2	Physical Requirements	246
711.12	Epoxy Mastic Maintenance Coating	247
711.12.1	General	247
711.12.3	Physical Requirements	247

SECTION	DESCRIPTION	PAGE #
711.12.6	Colored Epoxy-Mastics	247
711.20	Inorganic Zinc Rich System	248
711.20.1	General	248
711.20.2	Primer	248
711.20.4	Top Coat	249
711.20.4.1	Physical Requirements	249
711.21	Galvanize Repair (Zinc Rich Primer)	249
711.22	Zinc Rich Low Voc System	250
711.22.1	General	250
711.22.2	Primer	250
711.22.4.1	Requirements	250
711.22.5.1	System Requirements	250
711.40	Temporary White or Yellow Traffic Paint	251
711.40.1	Color and Retroreflectivity Requirements	251
711.41	White Or Yellow Fast-Dry Traffic Paint (Type II)	252
711.41.1	General	252
711.41.2	Color and Retroreflectivity Requirements	253
711.41.3	Sampling and Testing Procedures for Performance Samples	254
711.42	White Or Yellow Fast-Dry Traffic Paint (Type IX)	255
711.42.1	General	255
711.42.2	Color and Retroreflectivity Requirements	256
711.42.3	Sampling and Testing Procedures for Performance Samples	256
711.43	White Or Yellow Fast-Dry Traffic Paint (Type X)	258
711.43.1	General	258
711.43.2	Color and Retroreflectivity Requirements	259
711.43.3	Sampling and Testing Procedures for Performance Samples	259
712	**GUARDRAIL AND FENCE**	**261**
712.11	Safety Fence	261
713	**METAL PIPE**	**261**
713.9	Full Bituminous Coated Structural Plate Pipe, Pipe Arch, and Arches	261
714	**CONCRETE, CLAY, FIBER AND PLASTIC PIPE**	**261**
714.2	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	261
714.19	Corrugated Polyethylene Pipe	261
714.22	Polyvinyl Chloride (PVC) Pipe	262
714.23	Precast Reinforced Concrete Box Culverts	262
714.24	Non-Asbestos Fiber-Cement Storm Drain	262

SECTION	DESCRIPTION	PAGE #
	Pipe	
715	**MISCELLANEOUS MATERIALS**	**262**
715.4	Concrete Repair Materials	262
715.4.1	Cementitious Materials for Concrete Repairs	263
715.4.2	Non-Cementitious Materials for Concrete Repairs	263
715.11.6	Engineering Fabric for Erosion Control	263
715.11.8	Engineering Fabric for Separation	263
715.11.9	Engineering Fabric for Stabilization	263
715.11.10	Engineering Fabric for Pumped Sediment and Erosion Control (Dewatering Device)	263
715.23	Gabions	264
715.24.2	Permanent Erosion Matting	264
715.24.3	Acceptance	265
715.25	Ground Agricultural Limestone	265
715.40	Pavement Marking Material	265
715.40.2	Preformed Traffic Markings (Type V Material)	265
715.40.2.1	Contractor's/Manufacturer's Warranty and Adherence, Retroreflectivity, Color, And Road Presence Requirements	266
715.40.2.2	Approved Products Listing	268
715.40.3	Interim Pavement Markings (Type VIIA Interim Pavement Marking Tape)	268
715.40.3.1	Interim Pavement Markings (Type VIIA)	268
715.40.3.1.1	Requirements	268
715.40.4	Temporary Pavement Marking Tape (Types VIIB and VIIC)	269
715.40.4.1	Deleted	269
715.40.4.2	Temporary Pavement Markings (Type VIIB)	269
715.40.4.2.1	Requirements	269
715.40.4.3	Temporary Pavement Markings (Type VIIC)	271
715.40.4.3.1	Requirements	273
715.41	Traffic Safety Devices	273
715.41.5	Reusable Energy Absorbing Crash Terminal Device (Type I)	274
715.41.5.1	Description	274
715.41.5.2	Performance	274
715.41.6	Trinity Attenuating Crash Cushion (Type Ii)	274
715.41.6.1	Description	274
715.41.6.2	Performance	274
715.41.7	Acceptance	274
715.42	Traffic Signal Materials and Equipment	274
715.42.9	Signal Supports	274

SECTION	DESCRIPTION	PAGE #
715.42.9.1	Mast Arm Signal Supports (Type A1, A1l, A2, A2l, B1 and B1l)	274
715.42.9.1.4	Materials Incorporated Into The Support	275
715.42.9.2	Strain Pole Signal Supports (Types C1, C1l, C2 and C2l)	275
715.42.9.2.2	Materials Incorporated Into The Support	275
715.42.9.4.1	Type E1	275
715.42.9.4.2	Type E2	275
715.42.9.4.3	Type E3	275
716	**EMBANKMENT AND SUBGRADE MATERIAL**	**275**
716.1.1.2	Granular Material	275
717	**COMPACTION CONTROL OF BASE COURSE MATERIAL**	**276**
717.1	General	276
717.2	Test Methods	276
717.3	Density	276
718	**SEWER AND WATERLINE MATERIAL**	**276**
718.5	Plastic Pipe (PVC)	276
718.7	Plastic Pipe (Polyethylene)	277
718.10	Gate Valves	277
718.15	Miscellaneous Steel (Clamps, Rods, Etc.)	277
718.20	Fine Aggregate	277

DIVISION 100
GENERAL PROVISIONS

SECTION 102
BIDDING REQUIREMENTS AND CONDITIONS

102.7 - IRREGULAR PROPOSALS:

DELETE ITEM v. AND REPLACE WITH THE FOLLOWING:

v. Failure to sign, properly execute or return the bid bond on the official form furnished by the Division of Highways, unless a certified or cashiers check is provided in lieu thereof in accordance with 102.8.

102.15 - FREE COMPETITIVE BIDDING AFFIDAVIT:

DELETE THE SECOND SENTENCE OF THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING SENTENCE:

This affidavit must be sworn to before a Notary Public who must affix their seal thereto.

SECTION 103
AWARD AND EXECUTION OF CONTRACT

103.1 - CONSIDERATION OF PROPOSALS:

ADD THE FOLLOWING AT THE END OF THE SUBSECTION:

Proposals containing Special Provisions for Disadvantaged Business Enterprises utilization, will be considered as follows:

(a) When the low bidder's goal submitted in Section C Item 3 - Contractor's Goal for DBE participation, of the Notice contained in the project proposal, meets or exceeds the contract DBE goals, and the Division considers the amount of the bid to be reasonable, such bidder will be the successful bidder.

(b) When the low bidder's goal submitted in Section C Item 3 - Contractor's Goal for DBE participation, of the Notice contained in the project proposal, does not meet the DBE contract goal and the Division considers the amount of the bid to be reasonable, the bid will be accepted if he or she can show that good faith efforts were made prior to the bid to meet the contract goals.

(c) When the low bidder cannot satisfy the Division that good faith efforts have been made, this bid may be rejected and the second low bid will be evaluated in the same manner. This procedure will continue, evaluating bids in the same manner, evaluating bids in ascending order, until either the contract DBE goal is attained or good faith efforts can be verified and that bid will be accepted provided the amount thereof is considered reasonable by the Division.

103.5 - REQUIREMENT OF CONTRACT BOND:

DELETE PARAGRAPHS 1 AND 2 IN THEIR ENTIRETY AND REPLACE WITH THE FOLLOWING:

At the time of the execution of the contract, the successful bidder shall execute and deliver to the Division a good and sufficient surety or collateral bond payable to the State of West Virginia.

The successful bidder has the option of submission of the aforementioned bond in an amount equivalent to either 102 percent or 100 percent of the contract price.

The submission of the aforementioned bond in an amount equivalent to 102 percent of the contract price by the successful bidder is the standard expectation of the Division in order to comply with the current Special Provision for Subcontractor Prompt Payment and does not necessitate the withholding of retainage by the Division from monies due on future progress voucher estimates payable under the terms of the contract. Further, the decision by a particular contractor to submit said bond in an amount equivalent to 102 percent of the contract price shall be consistent and applicable throughout the duration of the contract for which the bond is being submitted and shall be consistent and applicable to all contracts executed between the Division and that particular contractor.

If the successful bidder elects to submit the aforementioned bond in an amount equivalent to 100 percent of the contract price, it is necessary that the bidder notify the Contract Administration Division in writing prior to the submission of the bond. Submission of a bond in an amount equivalent to 100 percent of the contract price does necessitate the withholding of retainage by the Division from monies due on future progress voucher estimates payable under the terms of the contract and as set forth in 109.6. Further, the decision by a particular contractor to submit said bond in an amount equivalent to 100 percent of the contract price shall be consistent and applicable throughout the duration of the contract for which the bond is being submitted and shall be consistent and applicable to all contracts executed between the Division and that particular contractor.

As an alternate, the successful bidder may deposit with the State Treasurer cash bond, United States Treasury bonds, United States Treasury notes, United States Treasury Certificates of Indebtedness, United States Treasury bills or West Virginia Road Bonds in the amount of either 102 percent or 100 percent of the

contract amount. A safe keeping receipt from a bank located in the State of West Virginia may be deposited with the State Treasurer in lieu of any of the definitive securities.

DELETE THE HEADING AND CONTENTS OF SECTION 103.6.1 AND REPLACE WITH THE FOLLOWING:

103.6.1 - Contractor's General Liability Insurance: The Contractor shall maintain commercial general liability (CGL) coverage with limits not less than:

General Aggregate	$2,000,000
Products/Completed Operations Aggregate	$2,000,000
Personal & Advertising Injury	$1,000,000
Each Occurrence *	$1,000,000
Fire Damage	$50,000
Medical Expense Limit	$5,000

* Each Occurrence limit shall be $2,000,000 when performing any operations that are subject to 107.8 – Railway-Highway Provisions.

The CGL shall be written on ISO occurrence form CG 00 01, or equivalent, and shall cover liability arising from premises-operations, independent contractors, products-completed operations, personal injury and advertising injury, and liability assumed under an insured contract. There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from explosion, collapse, or underground property damage whenever work involving these exposures are undertaken. The CGL policy shall include endorsements that amend the aggregate limits of insurance to be applicable to each construction project separately.

Contractor shall furnish an Acord Form 25-S Certificate of Insurance, or its equivalent, with a 30 day notice of cancellation provisions to evidence this CGL coverage.

DELETE THE HEADING AND CONTENTS OF SECTION 103.6.2 AND REPLACE WITH THE FOLLOWING:

103.6.2 - Employer's Liability Insurance: The contractor shall also give evidence of insurance for Employer's Liability Insurance, with a 30-day notice of cancellation. The Employer's Liability policy must include coverage to protect the contractor for claims brought under Section 23-4-2 of West Virginia Code. The limits of insurance under this section shall be as follows:

Each accident	$500,000
Each disease	$500,000
Each disease/employee	$500,000

Evidence of this coverage can be set forth on the ACORD 25-S specified in Subsection 103.6.1 or other approved form.

DELETE THE HEADING AND CONTENTS OF SECTION 103.6.4 AND LEAVE BLANK:

103.6.5 - Countersignature of Resident West Virginia Agent:

DELETE THE ENTIRE SUBSECTION AND REPLACE WITH THE FOLLOWING:

103.6.5 - Countersignature of West Virginia Agent: The policy or policies of Insurance required must be countersigned by an Agent Licensed in West Virginia, in accordance with the applicable statute of the State of West Virginia.

All certificates of insurance used to verify the policies issued must be endorsed by an Agent Licensed in West Virginia. Such endorsement must include the printed name, street address, city, zip code and West Virginia license number of the Agent.

SECTION 105
CONTROL OF WORK

105.2 - PLANS AND WORKING DRAWINGS:

DELETE THE FIFTH PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Working drawings for steel and timber structures shall consist of shop detail, erection and other working plans, showing details, dimensions, sizes of material, and other information necessary for complete fabrication and erection of the work. The Division will require shop lists for structural steel to be submitted in a format as set forth by the Engineer.

105.11 - INSPECTION OF THE WORK:

ADD AS LAST SENTENCE TO PARAGRAPH ONE:

To facilitate the inspection of materials, all delivery tickets shall contain as a minimum the information required in MP 700.00.01.

ADD THE FOLLOWING PARAGRAPH AS THE FIFTH PARAGRAPH:

No work shall be done at night, Saturdays, Sundays, or Holidays without documented prior approval of the Engineer.

SECTION 106
CONTROL OF MATERIALS

106.1 - SOURCE OF SUPPLY AND QUALITY REQUIREMENTS:

ADD THE FOLLOWING AFTER THE SECOND PARAGRAPH:

The Contractor shall maintain equipment and qualified personnel to perform all sampling and testing to determine the magnitude of the various properties of the materials during manufacturing and placement as governed by the Specifications and shall maintain those properties within the limits of the Specifications.

The contractor shall design a quality control plan detailing the methods by which the quality program will be conducted.

The quality control plan shall be in accordance with the applicable Specifications and Material Procedure(s) for the specified item. The plan should clearly describe the methods by which the Quality Control Program will be conducted. The Quality Control Plan shall be submitted to the Engineer at the Pre-Construction Conference. The work shall not begin on the applicable item(s) until the plan has been reviewed and found to be in conformance with the contract documents and accepted by the Engineer. Items that require testing by the Contractor, but stipulate that acceptance shall be based upon written certification, do not require Quality Control Plans.

106.1.1.1 - **Definitions:**

DELETE THE FINAL PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Buy America requirements apply to coating. Coating is considered a manufacturing process and is interpreted to mean all processes that protect or enhance the value of a material or product to which it is applied such as epoxy coatings, galvanizing or painting.

DELETE SECTION 106.1.1.2 AND REPLACE WITH THE FOLLOWING:

106.1.1.2 - Preference For Domestic Aluminum and Glass Products: The Division shall require that all aluminum or glass products to be supplied to purchase order or state and federal projects shall be domestic aluminum or glass products in compliance with Chapter 5, Article 19 of the West Virginia Code, unless the offered or bid price of the domestic aluminum or glass products is unreasonable or that the domestic aluminum or glass products are not produced in sufficient quantities to meet the project requirements. The offered or bid price of domestic aluminum or glass products is not unreasonable unless it is more than 20 percent higher than the offered bid price of foreign made aluminum or glass products (including any applicable duty) if the aluminum or glass products to be

supplied are produced in a "substantial labor surplus area" as determined by the United States Department of Labor, the offered or bid price of domestic aluminum or glass products is not unreasonable unless it is more than 30% higher than the offered or bid price of foreign-made aluminum or glass products (including any applicable duty). A listing of the "substantial labor surplus areas" can be obtained from the Division's Contract Administration Division. This Section does not apply to any state or federal project in an amount less than $50,000.00.

DELETE SECTION 106.1.1.4 AND REPLACE WITH THE FOLLOWING:

106.1.1.4 - Procedures For Use of Foreign-Made Materials: If foreign-made aluminum, glass or steel (iron) products are supplied in compliance with this Section, the Contractor shall be responsible for providing procedures acceptable to the Division for determining that specification requirements are met, including all inspections at no additional cost to the Division. The use of foreign-made products will not be reason for granting an extension of time.

DELETE SECTION 106.1.1.5 AND REPLACE WITH THE FOLLOWING:

106.1.1.5 - Use of Domestic Steel Products: When steel or iron is used it shall be in compliance with Section 165 of the Surface Transportation Assistance Act of 1982, the applicable provisions of Title 23 CFR, Section 635.410, as amended, entitled "Buy America Requirements," and Chapter 5A, Article 3, Section 56 and Chapter 5, Article 19 of the West Virginia Code.

Pig Iron and processed, pelletized, and reduced iron ore manufactured outside of the United States may be used in the domestic manufacturing process for steel and/or iron materials used in Federal-aid highway construction projects.

The Division shall require that all steel products to be supplied to purchase order or state and federal projects shall be domestic steel products in compliance with Chapter 5A, Article 3, Section 56 of the West Virginia Code.

These provisions may not prevent the minimal use of foreign steel provided the proper approval is obtained in writing per Chapter 5A, Article 3, Section 56, Subsection (b)(1) of the West Virginia Code.

ADD THE FOLLOWING:

106.1.1.6 - Domestic Steel Products: To be a Domestic Steel product all manufacturing processes, including application of a coating, for these materials must occur in the United States including all of its territories, continental, or insular, subject to the jurisdiction of the United States. Steel manufacturing processes shall include rolled, formed, shaped, drawn, cast, fabricated or otherwise similarly processed, or processed by a combination of two or more such operations, from steel made by the open hearth, basic oxygen, electric furnace, bessemer or other steel making process. Coating includes all processes that protect or enhance the value of the material to which the coating is applied.

SECTION 107
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

107.8 – RAILWAY-HIGHWAY PROVISIONS:

DELETE THE FIRST SENTENCE AND REPLACE WITH THE FOLLOWING:

The Contractor shall comply with the following provisions when performing any operations within the existing right of way of the Railroad or when railroad protective insurance is required by the contract documents. Railroad Protective insurance shall include all of the work set forth in 107.8 with exception of the provisions of sections 107.8.7 and 107.8.8.

DELETE THE HEADING AND CONTENTS OF SECTION 107.8.2 AND REPLACE WITH THE FOLLOWING:

107.8.2 - Insurance: The Contractor shall secure and provide, until all work under the terms of the project is satisfactorily completed and accepted, the following types of insurance in the amounts and form as hereinafter set forth:

107.8.2.1 - Contractor's Public Liability Insurance and Protective Public Liability Insurance: CGL coverage as required by Section 103.6.1 shall be written with a $2,000,000 Each Occurrence Limit. This limit may be single limit of primary coverage or a combination of primary and excess coverage which will meet the $2,000,000 requirement. A certificate of insurance shall be provided to the Railroad before work begins and said certificate shall provide the Railroad thirty (30) days advance written notice of cancellation or material change in insurance coverage. If any part of the work is sublet, Commercial General Liability Insurance and evidence thereof in the same amounts as required of the Prime Contractor, shall be provided by or in behalf of the subcontractor to cover his operations on railroad right of way.

107.8.2.2 - Railroad Protective Liability Insurance: With respect to the operations performed by the Contractor or subcontractors of any tier the Contractor must provide in the name of Railroad. This policy shall be written on the ISO/RIMA Form of Railroad Protective Insurance (ISO Form CG00350690) with Pollution Exclusion Amendment ISO Form CG 28311185 or their equivalents). The policy of insurance specified in this section shall be countersigned by a resident agent of the State of West Virginia in accordance with Section 103.6.5. The original of the policy shall be submitted to and approved by the Railroad before work is commenced on its right of way or within 200 feet of the nearest track or 1000 feet if blasting is required for the construction.

107.8.2.2.1 - Railroad Protective Liability Insurance Limits for Non-Passenger Railway Facilities: A policy providing a limit of $2,000,000 per occurrence for bodily injury and property damage combined. Said insurance shall be furnished with an aggregate of $6,000,000 applying separately to each annual period.

107.8.2.2.2 - Railroad Protective Liability Insurance Limits for Passenger Railway Facilities: A policy providing a limit of $5,000,000 per occurrence for bodily injury and property damage combined. Said insurance shall be furnished with an aggregate of $10,000,000 applying separately to each annual period.

ADD THE FOLLOWING SECTION:

107.26 - NOTIFICATION OF ABATEMENT, DEMOLITION OR RENOVATION:

The notification for projects involving abatement, demolition, or renovation will conform to this section. The Project Engineer will have a copy of all asbestos inspection reports available at the field office. The Contractor shall provide copies of all notifications and correspondence to the Project Engineer.

107.26.1 - Abatement: Abatement activities shall conform to section 681.

107.26.2 - Demolition:

107.26.2.1 - Asbestos Containing Materials Reported: Notifications will be in accordance with 107.26.4.

107.26.2.2 - No Asbestos Containing Materials Reported: For buildings or bridges that do not contain asbestos, *only the notification form* must be submitted to the West Virginia Division of Environmental Protection (DEP) and the United States Environmental Protection Agency (EPA) at the address given in 107.26.4.

If an asbestos inspection report indicates that there is no asbestos present on a bridge scheduled for demolition or renovation, the need for a trained individual to be on site during either process is waived. However, the Contractor shall have an individual trained in accordance with the provisions as set forth in 40 CFR Part 61, Subpart M on site to observe building demolition and file a report with the Project Engineer indicating if any suspect (asbestos containing) material was encountered during demolition. A copy of the individual's current training certification must be attached to this report.

107.26.3 - Renovation:

107.26.3.1 - Asbestos Containing Materials Reported: For projects involving the renovation of a bridge or building, that has asbestos containing materials, the Contractor shall submit a "Notification of Abatement, Demolition or Renovation" in accordance with 107.26.4.

107.26.3.2 - No Asbestos Containing Materials Reported: Structures that are being renovated and are free of asbestos, per the inspection report, do not require submittal of the "Notification of Abatement, Demolition or Renovation".

107.26.4 - Notifications: In accordance with state and federal regulations, the Contractor shall submit a "Notification of Abatement, Demolition or Renovation" to the address shown below prior to the commencement of demolition of any building or bridge (regardless of the presence of asbestos). All notifications must be made a minimum of 10 working days prior to the commencement of demolition or renovation operations. Particular attention is to be made to the "Schedule" section of the form. If for any reason, demolition or renovation cannot begin on the date as submitted, the DEP, Office of Air Quality must be notified at the address below:

West Virginia Division of Environmental Protection
Office of Air Quality
601 57th Street S.E.
Charleston, West Virginia 25304
Attn: Asbestos Coordinator
Telephone: (304) 926-0499
Fax: (304) 926-0478

United States Environmental Protection Agency
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
Attn: Stephen Forostiak, 3WC32
Asbestos Coordinator
Telephone: (215) 814-2100
Forostiak.stephen.epa.gov

If a building or bridge contains asbestos, the notification process as outlined in the Special Provision for Section 681, Asbestos Abatement shall be followed.

ADD THE FOLLOWING SUBSECTION:

107.27 - CONSTRUCTION ACCESS AND ENVIRONMENTAL PERMITS:

The Division has obtained permits for activities shown in the contract documents. The anticipated *Temporary Construction Access* (*TCA*) methods are

included, if a TCA is not shown in the plans, or the permit, it has been determined that at least one TCA method exists that does not require a permit. A copy of these permits is in the contract documents.

The contractor must comply with the approved permits and exercise best environmental management practices at no additional cost to the Division.

The permits do not cover waste or borrow sites, haul roads, storage sites, staging areas or activity not shown in the contract documents or permits. These permits are to be handled in accordance with Section 107.2.

107.27.1 - Temporary Construction Accesses: A Temporary Construction Access is any road, cofferdam, causeway and/or stream crossing, access fill, dike, channel retaining structure, etc that may be required to access the work. This work shall consist of the construction of all temporary construction access required for the project and shall include, but is not limited to, all culverts, structures, excavation, rock borrow and incidental construction as required to construct the access. This work shall also include all necessary work required to maintain and remove the temporary construction access and to restore the area to its original condition. All of the work shall be in accordance with these Specifications and in reasonably close conformity with the contract documents, approved permits, or as established by the Engineer.

No payments shall be made for the Temporary Construction Access unless otherwise stated in the plans.

107.27.1.1 - Changing Temporary Construction Accesses: The Contractor may elect to utilize alternate temporary construction access methods from those shown in the contract documents. If the Contractor proposes alternate temporary construction access methods, he shall obtain written approval from all affected landowners and shall provide to the Engineer all of the permit documents required to obtain additional or revised permits. The Division will submit the permit documents to the appropriate agencies for approval. Acceptance of the permit documents by the Engineer or forwarding them to the permitting agency does not guarantee or constitute approval of the permit. No work shall be performed on a permittable activity until a copy of all the appropriate approvals and permits are received by the Engineer. No time extensions or additional payments will be made for the contractor to obtain additional approvals or permits or for changes to the design of the temporary construction access.

107.27.1.2 - Excavated Material: The excavated material, unless otherwise directed by the Engineer, shall be utilized for backfill or embankments. Surplus material shall be disposed in accordance with section 207.6 and in such a manner that the efficiency or appearance of the structure shall not be impaired, and the stream shall not be obstructed or excess sediment introduced into the stream.

107.27.2 - Corps Of Engineers Permit: If this project has been determined to involve activities, which are regulated by the Department of the

Army, Corps of Engineers a permit has been included in the contract documents. These activities involve the discharge of dredge or fill materials into the Waters of the United States as regulated by Section 404 of the Clean Water Act or the obstruction or alteration of Navigable Waters of the United States regulated by Section 10 of the River and Harbor Act of 1899.

The Engineer will decide all questions that may arise as to the interpretation or violation of these conditions. The Contractor shall comply with the conditions of the Permits and the following.

1. Material will not be stockpiled in the watercourse.
2. Bilge, ballast or wash water pumped from barges or out of cofferdams will not be discharged into the watercourse without acceptable removal of solids, oils and/or toxic compounds.
3. Discharges shall be avoided during fish spawning seasons to the maximum extent practicable unless a note prohibiting such discharge is included in the construction plans.

SECTION 108
PROSECUTION AND PROGRESS

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

108.1 - SUBLETTING OF CONTRACT:

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or Contracts or any portion thereof, or of their right, title, or interest, without written approval of the Engineer prior to any of the subject work being performed. The Contractor will be permitted to sublet a portion thereof but shall perform, with his/her own organization, work amounting to not less than 30 percent of the total contract cost, except that any items designated in the Contract as "specialty items" may be performed by subcontract and the cost of any such specialty items so performed by subcontract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his/her own organization. No subcontracts, or transfer of contract, shall in any case release the Contractor of his/her liability under the Contract and Bonds.

The Contractor shall request the approval of each subcontractor, including lower-tier subcontractors. No work shall be performed by a subcontractor until the subcontractor has been approved. Each subcontract, including lower-tier subcontracts, shall be in writing and shall physically contain all of the applicable provisions, requirements, specifications, and safety plans. The Contractor may certify that a copy of all the applicable provisions, requirements, specifications, and safety plans has been provided and is physically incorporated in each subcontract including lower-tier subcontracts. Requests for approval of DBE subcontractors, however, shall also be accompanied by a copy of the proposed subcontract without the required attachments.

The Contractor shall maintain a complete subcontract file including lower-tier subcontractors at the home office, which shall be available to authorized personnel for review without notice, or at any other appropriate location as determined by the Division after a five day notice. Such file may contain a single copy of all the applicable provisions, requirements and specifications in lieu of individual subcontract files containing the applicable attachments.

108.1.1 – Subletting Of Contract Materials: Roadside production of materials is construed to be the production of crushed stone, gravel, or other materials with portable or semi-portable crushing, screening, or washing plants established or re-opened in the vicinity of the work for the purpose of supplying materials to be incorporated into the work on a designated project or projects, and in all cases, unless performed by the Contractor, shall be considered as subcontracting.

The purchase of sand, gravel, crushed stone, crushed slag, batched concrete aggregates, ready mixed concrete, or any other materials produced at and furnished from established and recognized commercial plants, together with the delivery of such materials to the site of work by means of vehicles owned or operated by such plants or by recognized commercial hauling companies, shall not be considered as subcontracting under these provisions. Except as stated, all hauling of materials from roadside production sources or from railroad or water delivery points to batching plants, mixing plants, or directly to their place of use in the road, and all hauling of materials from batching plants and mixing plants to their place of use in the road, unless done by the Contractor's own equipment or by recognized hauling companies, shall be considered as subcontracting under these provisions. If batching plants or mixing plants are set up at rail or water delivery points and materials in part supplied to such plants by rail or water transportation companies, the remaining materials required at such batching or mixing plants may be hauled to such plants without such hauling being considered as subcontracting.

108.2 - NOTICE TO PROCEED:

The Notice to Proceed will stipulate the date on which it is expected the Contractor shall begin work and from which date Contract time will be charged. In the event a Notice to Proceed cannot be issued, a Conditional Notice to Proceed may be issued upon the mutual agreement of the Division and the Contractor. The Conditional Notice to Proceed will be used to allow the Contractor to begin work on a portion of the project not impacted by the issue that created the need for the Conditional Notice to Proceed.

108.3 - PROSECUTION OF THE WORK:

108.3.1 - General: The Contractor shall provide sufficient resources (materials, equipment, and labor, etc.) to guarantee the completion of the project in accordance with the Plans and Specifications within the time set forth in the Proposal.

The Contractor shall submit a Detailed Construction Schedule and any subsequent schedules, as required by this specification, in the form of an Activities Schedule Chart (ASC) or a Critical Path Method (CPM) Schedule with all graphic and tabular supporting documentation, hereinafter referred to as "Schedule."

ASC and CPM Schedules will not be required for projects on which the major portion of the work is resurfacing, landscaping, signing, lighting, installing signals, guardrail or bridge painting, or on which the Contract Bid Amount is $2,000,000 or less. However, on all projects not requiring an ASC or CPM schedule, the contractor will provide the Division with an Anticipated Payment Summary (APS) for the project.

The contractor's Anticipated Payment Summary (APS) will be provided to the Division within fourteen (days) of the Notice of Award. The APS will detail the Contractors anticipated monthly payments from the Division throughout the life of the contract. The Summaries shall be for the calendar months of the project. The Contractor will provide the Division with an updated APS within fourteen (14) days of any schedule changes to the project.

Activities Schedule Chart (ASC) will be required for all projects on which the Contract Bid Amount is greater than $2,000,000 but less than $7,500,000, except for project types as noted in the previous paragraph.

Critical Path Method (CPM) Schedules will be required for all projects on which the Contract Bid Amount is equal to or exceeding $7,500,000 or containing an I/D Clause.

The submitted Schedule shall include a written certification on the face of the Schedule, as well as on any diagrams and drawings, stating that the Schedule is within the contractual limits and that the submitted Schedule is the only schedule the Contractor will use for all critical work activities, interdependent work activities, phase construction, stage construction, resource needs, transmittals for Contractor designs, drawings and other submissions, activities for subcontractors, vendors, and suppliers, and all other controlling and subsequent activities. This same written certification shall be included on all Schedule updates and revisions.

The Schedule shall show the interdependent and logical sequence of construction activities. The Schedule shall reflect that all contract time requirements are essential conditions of the Contract and shall also include allowances for seasonal weather conditions, the influence of high or low ambient temperatures, as well as any extra shifts, overtime, or additional manpower and equipment necessary to complete the critical and non-critical activities within the allotted Contract time without additional cost to the Division.

The Contractor may submit a Schedule with a completion date earlier than the Contract Completion Date set forth in the Proposal. However, the Division will not be liable in any way for the Contractor's failure to complete the Project prior to the specified Contract Time except as when provided in Section 108.6. Any additional cost, including extended overhead incurred between the Contractor's scheduled completion date and the Contract Completion Date set forth in the Proposal, shall be the responsibility of the Contractor.

The Division's review of the Schedule does not represent approval of the Contractor's estimate of resources (labor, material and equipment), method of operation, or production rates.

108.3.1.1 - Submission Of Construction Schedules: The Contractor shall designate a competent representative, hereinafter referred to as Construction Coordinator, who shall have the decision-making authority for the Contractor to control the work in accordance with the Schedule(s) for the duration of the Contract.

With the exception of the following preliminary items: establishing the field office, setting up traffic control, and mobilizing equipment, no item of work under the contract may be pursued following the Notice to Proceed or the Conditional Notice to Proceed until a Preliminary Construction Schedule or Detailed Construction Schedule has been submitted by the Contractor and reviewed by the Engineer. The Engineer may withhold estimates until such time as a Schedule has been received and reviewed.

108.3.1.2 - Preliminary Construction Schedule: Within thirty (30) calendar days of the contract award date, the Contractor may submit a sixty (60) calendar day Preliminary Construction Schedule for review by the Engineer. The Preliminary Schedule shall include a generalized project schedule for the balance of the work in summary form indicating **t**he contract completion date. The Contractor shall maintain and submit monthly a sixty (60) calendar day Preliminary Construction Schedule until the Detailed Construction Schedule is submitted by the Contractor and reviewed by the Engineer.

108.3.1.3 - Detailed Construction Schedule: The Detailed Construction Schedule shall include a report system that is maintained throughout the life of the project to measure all factors that affect the completion date. Within sixty (60) calendar days of the contract award date, the Contractor shall submit a Detailed Construction Schedule indicating the contract completion date for review by the Engineer.

The Engineer will review the Detailed Construction Schedule and supporting documentation for compliance with the Contract within fourteen (14) calendar days after receipt in accordance with provision 108.6.2. The Contractor shall provide the Engineer with a revised Detailed Construction Schedule incorporating any compliance recommendations made in the Engineer's review. This schedule shall become the official Schedule and shall be used by the Contractor. The official Schedule must be completed within ninety (90) calendar days of the Contract award date. The Engineer may withhold estimate payments for any item of work under the Contract after ninety (90) calendar days until the Contractor's Detailed Construction Schedule has been reviewed and all comments have been addressed.

108.3.1.4 - Construction Schedule Requirements: The Preliminary Schedule and the official Detailed Construction Schedule shall be submitted in

hard copy and shall include a legend for symbols and abbreviations used. Activities with duration times in excess of fifteen (15) working days, except for non-construction activities, shall be kept to a minimum and be subject to review by the Engineer. The Schedule shall provide a minimum of ten (*10)* activities or categories, hereafter referred to as "Activities," per million dollar value of the Contract and a maximum of three hundred (300) activities or as directed by the Engineer.

The Schedule shall indicate the interdependence of Activities (how the start of a given activity depends on the completion of preceding Activities) and the sequence of work (how failure to complete a given activity may restrain the start of successive activities).

The Schedule shall include the Contract completion date and any interim completion dates contained in the Contract, as well as any coordination and cooperation requirements, construction restrictions, or other requirements of the Contract.

The Schedule shall include Activities for all work required by the Contract, including Activities for subcontractors, vendors, and suppliers. In addition to construction activities, the Schedule shall include as a minimum the procurement, fabrication, and delivery of critical or special materials and equipment, as well as submission and review of all shop/work drawings, Contractor designs, and all other submissions required by the Contract.

The Activities are to be described by Contract item number, location, phase, and sequence so that the work is readily identifiable and the progress of each Activity can be measured. For CPM Schedules, the Contractor shall provide the labor and equipment involved with each Activity. For CPM and ASC Schedules, each Activity will have an associated dollar amount documented on the Schedule. This Activity dollar amount will be in direct relation to the bid items and quantity of work included in the Activity. Activity duration shall be logical and consistent with the Contract documents and shall be based on realistic and available resources of the Contractor. The above requirements are applicable for all CPM Schedules, including the official Detailed Construction Schedules, required updates, and any revised Schedules.

Requiring the Contractor to submit Schedules allocating resources to project Activities does not imply acceptance, approval, or agreement by the Division that the Contractor's scheduled allocation of resources is sufficient to complete either the project or a scheduled activity in a scheduled time.

108.3.2 - Critical Path Method (CPM) Schedule: The Schedule shall be in CPM Network Schedule precedence format. Refer to "*The Use of CPM in Construction – A Manual for General Contractors and the Construction Industry*," latest edition published by the Associated General Contractors of America (AGC).

The precedence diagram shall be submitted on standard D size sheets (24" x 36"). The critical path shall be distinguished from other paths on the Schedule. All back-up data used to generate the Schedule shall be submitted in digital form on acceptable media that is compatible with the computer system. The Schedule

shall be prepared using the version of the scheduling and cost control system specified in the most recent computer specification Section 640.11 as posted on the *WVDOT Engineering Publications* website (http://www.wvdot.com/engineering/TOC_engineering.htm) by selecting *Standard Specifications for Roads and Bridges* (PDF file), then select *Section 640* and scroll to *Computer System for Field Office*

The Schedule shall include the following data for each activity in the initial submittal and in all updates and revisions:

1. Activity number, as well as preceding and following activity numbers;
2. Activity description;
3. Duration of activity, in working days;
4. All quantities in accordance with pay items;
5. Number of work days per week for activity;
6. Number of shifts per work day**,** hours per shift for activity;
7. Major equipment and corresponding hours for activity;
8. Manpower by Trade or entity and corresponding hours for activity;
9. Dollar value of activity;
10. Remaining duration of activity, in working days;
11. Earliest start date, by calendar date;
12. Earliest finish date, by calendar date;
13. Actual start date, by calendar date;
14. Actual finish date, by calendar date;
15. Latest start date, by calendar date;
16. Latest finish date, by calendar date;
17. Total float for activity;
18. Free float for activity;
19. Activity Usage Profile Cost of monthly expenditures**.**

108.3.3 - Activities Schedule Chart (ASC) Schedule: The ASC Schedule shall meet the requirements of a CPM schedule as described in Section 108.3.2 with the exception of Bullet 7 (Major equipment and corresponding hours for activity) and Bullet 8 (Manpower by Trade or entity and corresponding hours for activity). The controlling operation must be distinguished from other operations on the schedule. The duration shall note periods of non-work when the non-working period exceeds three (3) consecutive calendar days. The Schedule shall be submitted with a written narrative accompanied by a precedence diagram, chronologically sequenced and to time scale, showing construction prosecution or preparation, including an activity description for each activity as well as its duration by working days (for working day Contracts only) or calendar days. The precedence diagram shall be submitted on standard legal size sheets (8.5" x 14") or larger.

108.3.4 - Progress Reporting And Schedule Updating: The Contractor shall submit weekly a summary of work force by Trade including all workmen

and subcontractors together with a weekly summary of all equipment used on the project. The Division shall maintain the Contractor's resource information in a confidential manner. The Contractor's certified payrolls may be a substitute for the work force summary. A Project Control Meeting shall be held monthly by the Engineer with the Contractor's Construction Coordinator to review actual progress, planned progress for the next period, and any changes since the previous update(s). Projects that require ASC Schedules may hold Project Control Meetings less frequently if deemed appropriate by the Regional Engineer, but not less than quarterly.

For projects that require CPM Schedules, at least five (5) working days before the meeting, the Construction Coordinator shall provide the Engineer with a complete update of all schedule activity information included in 108.3.3. The Engineer may withhold estimate payments until the Contractor submits a Schedule update five (5) working days prior to the next Project Control meeting.

For projects that require ASC Schedules, the Construction Coordinator shall provide the Engineer with a complete update of all schedule activity information included in 108.3.2 within five (5) working days after the end of the month. The Engineer may withhold estimate payments until the Contractor submits a Schedule update within five (5) working days after the end of the month.

The Contractor shall submit with the monthly update a narrative report which shall include, but not be limited to, a description of progress along the critical path in terms of days ahead or behind the Schedule dates, any problem areas (current and anticipated), any delaying factors and their impact, and an explanation of any corrective actions taken or proposed. The narrative report shall state any and all changes made in the Schedule since the previous update(s) and detail all activities or portions of activities, including dollar value, completed during the update period.

Prior to submittal, the contractor shall compare the updated progress Schedule to the most current estimate payment. The total activity cost to date shown on the Schedule shall match the total paid to date on the estimate. To achieve this match the contractor is required to account for all ancillary costs by altering activity dollar amounts due to overruns and under-runs. Change Orders, Value Engineering and other required project modifications shall be incorporated into the Schedule as necessary to reflect the actual cost and scope of work being performed.

The method for accurately incorporating the project costs into the Schedule will be determined by the Contractor. The method for incorporating the project cost into the Schedule will be subject to review and comment by the Engineer. In any case, the intent is to create updated schedules that accurately reflect the progress of the project. Inclusive of the progress shall be the tracking of project costs in such a way that future project expenditures can be determined with relative accuracy.

Extension of Interim Completion Dates, the Contract Completion Date, or the revised Contract Completion Date will be governed by the provisions of 108.6.

If the Division revises work which would affect the sequence of operations or duration of time on work activities, the Contractor shall submit to the Engineer,

within seven (7) calendar days after receipt of the revision, a written report in accordance with 108.6 outlining the effect on work time and cost that the revision is expected to have on the Schedule.

108.3.5 - Submission Of Revised Construction Schedule: The Engineer shall request the Contractor to submit a revised Schedule when any one of the following conditions is reflected by the latest Schedule:

1. A delay greater than ten (10) calendar days in the completion of any critical activity;
2. The performance of any work in a sequence or manner which varies from that represented on the Schedule;
3. The addition, deletion, or revision of activities required by Contract modification.

The revised Schedule shall indicate all additional resources (labor, material, and equipment) and modification(s) of operations necessary to meet the contract time requirements.

The Engineer will review the revised Schedule and supporting documentation for compliance with the Contract. The Contractor shall incorporate any compliance recommendations made in the Engineer's review. Should the Contractor fail to submit a revised Schedule within seven (7) calendar days of the Engineer's written request, the Engineer may withhold estimate payments for any item of work under the Contract until such Schedule is submitted.

108.4 - LIMITATION OF OPERATIONS:

The Contractor shall conduct the work at all times in such manner and in such sequence as will assure the least interference with traffic. The Contractor shall have due regard to the location of detours and to the provisions for handling traffic. The Contractor shall not open up work to the prejudice or detriment of work already started, and the Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience.

108.5 - CHARACTER OF WORKERS; METHODS AND EQUIPMENT:

The Contractor shall at all times employ sufficient labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these Specifications.

All employees shall have sufficient skill and experience to perform properly the work assigned to them. Employees engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person who, in the opinion of the Engineer, does not perform *his/her* work in a proper and skillful manner or is intemperate or disorderly shall, at the

request of the Engineer, be removed forthwith. Any Contractor or his/her subcontractor employing such person shall not reemploy such person on the project without the written approval of the Engineer. Should a Contractor fail to remove such a person or persons as required above or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until such order is complied with.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no damage to the roadway, adjacent property, or other highways will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract, the Contractor is free to use any methods or equipment that the Contractor demonstrates will accomplish the Contract work in conformity with the requirements of the Contract.

When the Contract specifies that the construction be performed by the use of certain methods and/or equipment, such methods and/or equipment shall be used unless others are authorized by the Engineer. Should the Contractor desire to use a method or type of equipment other than specified in the Contract, the Contractor shall request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor shall be fully responsible for producing construction work in conformity with Contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute methods or equipment and shall complete the remaining construction with the specified methods or equipment. The Contractor shall remove the deficient work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved nor in Contract time as a result of authorizing a change in method or equipment under these provisions.

108.6 - DETERMINATION AND EXTENSION OF CONTRACT TIME:

108.6.1 - General: The Division shall determine and specify in the Contract the number of working days and/or a fixed calendar date allowed for completion of the Work, hereinafter called Contract Time.

A potential working day is every day on the calendar except Saturday, Sunday and holidays as set forth in 101.42.

When the Contract Time is specified on a working day basis, the Engineer will inform the Contractor weekly, by written statement, of the number of working days charged for the preceding week, the accumulated number of working days charged against the Contract, and *the* number of working days

remaining for completion of the Contract. The Contractor shall submit in writing to the Engineer any protest concerning the weekly statement within seven (7) calendar days after receipt of the statement. The written protest shall set forth what the Contractor considered incorrect, along with supporting information; otherwise, the statement shall be deemed to have been accepted by the Contractor as correct. The Engineer shall review any such protest and supporting information and shall render a decision either affirming or correcting the number of working days previously reported for the contested week, within fourteen (14) calendar days after receipt of the written protest.

When the Contract Time is specified on a fixed calendar date basis, it will consist of the number of calendar days counting from the effective date of the Engineer's issuance of the Notice to Proceed or Conditional Notice to Proceed to the calendar date specified for completion of the project, including all Saturdays, Sundays, holidays, and non-working days. All calendar days elapsing between the effective dates of any orders of the Engineer to suspend work and to resume work for suspensions not the fault of the Contractor shall be excluded.

The work on the Contract will be considered substantially complete when the Project could be opened continuously for the safe, convenient, and unimpeded use of the traveling public, or the Project has met the intention of the plans, as reasonably determined by the Engineer. When the Project is considered substantially complete, the Contract time charges shall be discontinued prior to final acceptance being made by the Engineer as prescribed in 105.16.

108.6.2 - Extension Of Contract Time: The Contractor shall be responsible for any delays caused by failing to start a work activity on the earliest date any activity can begin after its predecessors have been completed, unless the activity has float. The Contractor shall also be responsible for any delays caused by lack of continuous effort, inadequate allocation and scheduling of resources and coordination of the work, inadequate or insufficient application of resources, or inability to meet interim completion dates due to Contractor's approach to the work. Such delays shall not be considered for an extension of Interim Completion Dates, Contract Completion Date, or the Revised Contract Completion Date.

If the Contractor finds it impossible for reasons beyond his control to complete an activity or the work within the Contract time as specified or as extended according to the provisions of this Section, the Contractor shall notify the Engineer, in writing, within seven (7) calendar days of the Contractor becoming aware of the following:

1) a problem that develops requiring direction to the Contractor by the Engineer;
2) the occurrence of any delay including delays in critical path activities;
3) in the absence of a CPM or ASC schedule, delays in the controlling operation during the prosecution of Work that the Contractor believes may warrant revision of an Interim Completion date or the Contract Completion Date.

The notification shall set forth the reasons that shall justify the granting of the request, and as a minimum, identify the cause(s) for the delay, the particular critical path activity(s) or controlling operation(s) affected, the effect of any Division act or omission on each activity or operation delayed, and the significant dates that encompass the periods of delay. On projects with Schedules, the Contractor shall submit a Schedule update within seven (7) calendar days of becoming aware of the delay and another Schedule update when the Contractor indicates or the Engineer believes the delay has been resolved. In instances where controlling or critical path activities are claimed by the Contractor or determined by the Division to be delayed, the notification and Schedule update shall be considered by the Division as a request by the Contractor for a Contract time extension. If the schedule updates relating to the delays, are not received as mentioned above, the Contractor forfeits his rights to any claims or time extensions.

In the absence of a CPM or ASC Schedule, the controlling item will be determined from the Division's records. The Engineer will inform the Contractor weekly, by written statement, of controlling items identified for the previous week. The Contractor shall submit in writing to the Engineer any protest concerning the weekly statement within seven (7) calendar days after receipt of the statement. The written protest shall set forth what the Contractor considered incorrect, along with supporting information; otherwise, the statement shall be deemed to have been accepted by the Contractor as correct. The Engineer shall review any such protest and supporting information and shall render a decision either affirming or correcting the controlling items reported for the contested week.

If notification is not given by the Contractor within the prescribed time of the Contractor becoming aware of any delay, or if, having given notification as provided herein, the Contractor does not afford the Engineer proper facilities for keeping strict account of actual costs and loss of time, the Contractor waives any claim for additional compensation and Contract time extension. Delay costs allegedly incurred more than the allowable seven (7) days before the Contractor notifies the Engineer in accordance with this provision shall not be allowed.

If the Engineer determines that the Work was delayed because of conditions beyond the control of and without the fault or negligence of the Contractor, the Engineer may extend the time for project completion as the conditions justify.

Only delays in the activities on the critical path, or in the absence of scheduling requirements, delays in the controlling operation will be considered for a Contract time extension, provided when required, the Contractor has submitted proper notification and supporting documentation justifying the request. The Engineer shall promptly advise the Contractor in writing of the approval or rejection of the time extension request. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

108.6.2.1 - Excusable Noncompensable Delays: An excusable noncompensable delay is a delay in the critical path activity, or in the absence of a

project Schedule, a delay in the controlling operation that was beyond the Contractor's control and not caused by the Contractor's fault or negligence. Consideration may be given to an adjustment in Contract time, but no consideration shall be given for additional monetary compensation. Excusable non-compensable delays include, but are not limited to:

1. Delay of Notice to Proceed or Conditional Notice to Proceed of more than thirty (30) calendar days after the contract award date for reasons beyond the control of and without the fault or negligence of the Contractor. Consideration for an adjustment of Contract time will be limited to the number of calendar days in excess of thirty (30) calendar days, counting from the Contract award date to the effective date of the Engineer's issuance of the Notice to Proceed.
2. Delay of the Notice to Proceed more than seven (7) calendar days after the contract award date for contracts with Incentive/Disincentive clauses, as long as the reasons are beyond the control of and without the fault or negligence of the Contractor. Consideration for an adjustment of Contract time will be limited to the number of calendar days in excess of seven (7) calendar days on contracts with Incentive/Disincentive clauses, counting from the Contract award date to the effective date of the Engineer's issuance of the Notice to Proceed.
3. Delays due to acts of God, labor strikes (not within the Contractor's power to settle) freight embargoes, states of national emergency, or other reasons beyond the control of the Contractor. Consideration for an adjustment of contract time shall be limited to the number of potential working days lost as determined by the Engineer.
4. Delays in obtaining materials due to extraordinary market conditions caused by industry- wide strike, natural disaster, area-wide shortage, official federal declaration that a material is critical due to national defense efforts, or for other reasons beyond the control of the Contractor. Consideration for an adjustment of contract time shall be limited to the number of potential working days lost as determined by the Engineer.
5. Delays due to adverse weather. Lost days due to adverse weather may include:
    (1) Days with inclement weather or conditions beyond the Contractor’s control that prevent the involvement of their normal working forces engaged in performing critical or controlling item(s) of work for at least sixty (60) percent of the total scheduled daily hours, and
    (2) Days when weather conditions prevent work from beginning at the regular time and the crew is dismissed, regardless of whether or not conditions improve for the rest of the day.

An adjustment of Contract time shall not be considered for loss of time due to adverse weather:

a. before the start of construction operations;
b. during periods when no on site- work on a controlling operation or critical path activity occurs;
c. after November 30 and before April 1 of the following year;
d. after the Contract completion date or the Revised Contract completion date.
e. Consideration for an adjustment of contract time shall be limited to the number of potential working days lost each month, as determined by the Engineer. Notification by the Contractor of weather related delays may be consolidated into a single request that shall be included in the narrative letter transmitting the monthly schedule update. On projects that do not require Schedules, the request shall be received within seven (7) calendar days of the end of the month in which the weather delays occurred. If a Schedule is not required for the project, any time extensions granted by the Engineer shall be on the basis of an additional working day for each potential working day lost.

The allowable time required for the Division to take action on properly prepared submissions shall be fourteen (14) calendar days after receipt unless otherwise specified in the Contract documents.

108.6.2.2 - Excusable Compensable Delays: An excusable compensable delay is a delay in the critical path activity, or in the absence of a project Schedule, a delay in the controlling operation that was caused solely by the Department. An adjustment in Contract time may be considered along with additional monetary compensation, if entitled. Excusable compensable delays include:

1. Delays in a critical path activity, or in the absence of a project Schedule, a delay in the controlling operation due to contract modifications resulting in the performance of added work, revised work, or work in greater quantities than those set forth in the Proposal except as provided in 104.11. The Division reserves the right to negotiate unit prices that include the cost for additional resources (labor, material and equipment) required to complete added work, revised work, or work in greater quantities within the originally scheduled dates, thereby negating the need for a Contract time adjustment.

Should a substantial delay be anticipated, the Department may request the Contractor to submit his/her costs and conditions for demobilization and

remobilization. The Department may pay the Contractor for demobilization/remobilization expenses in lieu of further idle equipment costs.

Consideration for adjustment of Contract time for added or revised work shall be limited to the extra time allowances as agreed on and specified in the Change Order that covers the added or revised work. Mark-up for the added or revised work will be negotiated and specified in the Change Order. The adjustment of contract time and the allowable mark-up will be full and just compensation for any and all claims that the Contractor may have regarding the added or revised work. No additional consideration will be given for Home office overhead and/or Field office overhead.

Any adjustment of Contract time for Work authorized in accordance with 104.11 that requires the performance of work in greater quantities than those specified in the Contract shall be made at the discretion of the Engineer in accordance with one of the two options below:

a. The extra time allowances as agreed on and specified in the Change Order that covers the additional or increased work; or
b. The same ratio that the total cost of the added or increased work shall bear to the total contract bid amount, provided the added or increased work is judged to be a critical path activity or, in the absence of a project Schedule, a controlling operation.

2. Loss of time due to differing site conditions. Consideration for adjustment of Contract time shall be according to Section 104.9.
3. Loss of time due to any written orders of the Engineer suspending work or delaying critical path activities on the project not the fault of the Contractor. Consideration for adjustment of Contract time shall be according to Section 104.10.
4. Loss of time due solely to acts or omissions by the Division and not caused or contributed to by the Contractor's fault or negligence.

The allowable time required for the Division to take action on properly prepared submissions shall be fourteen (14) calendar days after receipt unless otherwise specified in the Contract documents.

Consideration for an adjustment of Contract time shall be limited to the number of potential working days lost as determined by the Engineer.

108.7 – COMPLETION DATES:

108.7.1 – Failure To Complete On Time And Liquidated Damages: Time is an essential element of the Contract, and it is important that the work be completed within the time specified. The cost to the Division for the administration of the Contract, including engineering, inspection, and supervision, will increase as the time required to complete the work is increased.

Therefore, the Division will assess liquidated damages against the Contractor for each calendar day any work remains uncompleted after the Contract time

specified for completion of the work, subject to such extensions of contract time required or permitted in 108.6. Daily charges will be deducted for each calendar day, as defined in 101.10, on all contracts, except daily charges will not be deducted between November 30 and April 1. The total amount of daily charges will be deducted from any monies due the Contractor, not as a penalty but as liquidated damages. Unless specified elsewhere in the Contract, the amount of the daily charge will be calculated from the table posted at the WVDOH Contractors Resource web page: http://www.wvdot.com/10_contractors/10_contractors.htm on the date the project is first advertised.

108.7.2 - Interim Completion Date: When an interim completion date has been specified in the Contract documents for the Contractor to complete a specific amount of work, pay item, or structure, and if the Contractor fails to meet the interim date, the Division will assess a per calendar day charge as liquidated damages, as specified elsewhere in the Contract documents until such amount of work, pay item, or structure has been completed. Extension of interim completion dates will be governed by the provisions of 108.6. The liquidated damages provided for in this subsection are in addition to those provided for elsewhere in this Section.

108.7.3 - Incentive/Disincentive for Early Completion: When an Incentive/Disincentive (I/D) provision has been included in the Contract documents, Subsection 108.7.1 relating to liquidated damages remains in effect and is applicable to the total Contract time; however, there will be concurrent assessment of liquidated damages with disincentive assessments. Extension of the date(s) established for completion of work stages covered by the I/D provision and/or the Contract completion date will be governed by the provisions of 108.6.

108.8 - DEFAULT AND TERMINATION OF CONTRACT:

If the Contractor**:**

1. fails to begin work under the Contract within the time specified in the "Notice to Proceed"; or
2. fails to perform the work with sufficient employees and equipment or sufficient materials to assure the prompt completion of the work; or
3. performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable;
4. discontinues the prosecution of the work; or
5. fails to resume work which has been discontinued within a reasonable time after notice to do so; or
6. becomes insolvent or is declared bankrupt or commits any act of bankruptcy or insolvency; or
7. allows any final judgment to stand against the Contractor unsatisfied for a period of ten (10) days; or
8. makes an assignment for the benefit of creditors; or

9. for any other cause whatsoever, fails to carry out the Contract terms in an acceptable manner;

the Engineer will give notice in writing to the Contractor and his/her Surety of such delay, neglect or default. If the Contractor or Surety, within a period of ten (10) days after such notice, shall not proceed in accordance therewith, the Division will, upon written notification from the Engineer of the fact of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority, without violating the Contract, to terminate the Contract. The Division may appropriate or use any or all materials and equipment on the ground as may be suitable and acceptable and may enter into an agreement with another contractor for the completion of the Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of the Contract in an acceptable manner.

All cost charges incurred by the Division, together with the cost of completing the work under Contract, will be deducted from any money due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the surety shall be liable and shall pay to the Division the amount of such excess.

108.9 - TERMINATION OF CONTRACT FOR CONVENIENCE OF THE STATE:

The Division may terminate the entire Contract or any portion thereof, if the Engineer determines that a termination is in the Division's interest. The Engineer will deliver to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

1. **Submittals and Procedures.** After receipt of a Notice of Termination, the Contractor shall immediately proceed with the following obligations:
    a. Stop work as specified in the notice.
    b. Place no further subcontracts or orders for materials, services, or facilities for the terminated portion of the Contract.
    c. Terminate all subcontracts that relate to the work terminated.
    d. Settle all outstanding liabilities and termination settlement Proposals arising from the termination of the contract or portion thereof.
    e. Transfer title and deliver to the Division (1) fabricated, partially fabricated, or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (2) the completed or partially completed plans, drawings, information, and other property that, if the Contract had been completed, would be required to be furnished to the Division.

f. Complete performance of the work not terminated.
g. Acceptable materials obtained by the Contractor for the Project that have not been incorporated in the work shall be inventoried in conjunction with the Engineer at a date identified by the Engineer.
h. Take any action necessary, or that the Engineer may direct, for the protection and preservation of the property related to the Contract that is in the possession of the Contractor and in which the Division has or may acquire an interest.

2. **Settlement Provisions.** When the Division orders termination of all or a part of the Contract effective on a certain date, completed items of work as of that date will be paid for at the Contract bid price. Payment for partially completed work will be made either at agreed prices or under the provisions below. Items that are eliminated in their entirety by such termination shall be paid for as provided in Subsection 109.5.

   a. **Additional Costs.** Within sixty working days of the effective termination date, the Contractor shall submit a claim for additional damages or costs not covered above or elsewhere in the Contract. Such claim may include such cost items as reasonable idle equipment time, mobilization efforts, bidding and project investigative costs, overhead expenses attributable to the project terminated, legal and accounting charges involved in claim preparation, subcontractor costs not otherwise paid for, actual idle labor cost if work is stopped in advance of termination date, guaranteed payments for private land usage as part of the original Contract, and any other cost or damage for which the Contractor feels reimbursement should be made.

      The Contractor and the Division may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. Anticipated profits will not be considered as part of any settlement. The agreed amount may not exceed the total Contract price as reduced by the amount of payments previously made, and the Contract price of work not terminated. The Contract shall be amended, and the Contractor paid the agreed amount.

   b. **Additional Cost Review.** If the Contractor and the Division fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Division will pay the amounts determined as follows, but without duplication of any amounts agreed upon above:

i. For Contract work performed before the effective date of termination, the total (without duplication of any items) of:

    1) The cost of work performed;
    2) The cost of settling and paying termination settlement Proposals under terminated subcontracts that are properly chargeable to the termination portion of the Contract if not included in subparagraph 1 above; and
    3) A sum, as profit on (1) above determined by the Division to be fair and reasonable. The Division shall allow no profit under this subdivision if the Contractor's costs incurred on work performed exceed the bid item payments made.

ii. The reasonable costs of settlement of the work terminated, including:

    1) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and support data;
    2) The termination and settlement of subcontracts (excluding the amounts of such settlements); and
    3) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

iii. Except for normal spoilage, and to the extent that the Division expressly accepts the risk of loss, Division will exclude from the fair value, all that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Division or to the buyer.

iv. In arriving at the amount due the Contractor under this clause, there will be deducted the following:

    1) All unliquidated advance or other payments to the Contractor under the terminated portion of the Contract;
    2) Any claim that the Division has against the Contractor under the Contract; and
    3) The agreed price for or the proceeds from the sale of materials, supplies, or other things

acquired and sold by the Contractor not recovered by or credited to the Division.

If termination is partial, the Contractor may file a Proposal with the Division for an equitable adjustment of the price(s) of the continued portion of the Contract. The Division will make any equitable adjustment agreed upon. Any Proposal for an equitable adjustment under this clause shall be requested within sixty (60) working days from the effective date of termination unless extended in writing by the Engineer.

The Division may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the termination portion of the Contract, if these payments will not exceed the amount to which the Contractor is entitled.

The Contractor shall maintain and make available all project cost records to the Division for audit to the extent necessary to determine the validity and amount of each item claimed. This includes all books and other evidence bearing on the Contractor's costs and expenses under the Contract. These records and documents shall be made available to the Division at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Division, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

Termination of the Contract or portion thereof shall not relieve the Contractor of contractual responsibilities of the work completed, nor shall it relieve the Surety of its obligation for and concerning any just claim arising out the work performed.

108.10 - FIELD OFFICE OVERHEAD

The Division may consider compensating the Contractor for Field office overhead costs as long as the Contractor can provide documentation that the field office overhead costs are not covered by the project bid items.

108.11 - HOME OFFICE OVERHEAD

The Department shall consider payment to the Contractor for any unabsorbed or extended home office overhead costs for which payment is not previously provided for if all of the following criteria are met:

(1) The Contractor has incurred an excusable, compensable delay that delays the Work at least forty five (45) Calendar Days beyond the Scheduled Contract Completion Date or the Revised Completion Date. These days are cumulative throughout the project.

(2) The delay for which payment of home office overhead is sought is only due to delays defined in 108.6.2.2.

Payment will be considered for every eligible day beyond the Scheduled or Revised Contract completion date at the rate determined below up to substantial completion, as determined by the Engineer.

108.11.1 – Home Office Overhead Rate

Calculate the home office overhead daily rate using the following formula:

$$\frac{A}{B} xC = D$$

then

$$\frac{D}{E} = F$$

Then

$$FxG = Amount_Claimed$$

Where:

A = Contract billing amount
B = Contractor's total billings for Contract period
C = Contractor's total overhead for contract period
D = overhead allocable to Contract
E = days of performance
F = daily contract overhead
G = number of days of delay

Contract duration term, E, includes every Calendar Day from the execution of the Contract, unless otherwise specified by the Engineer, to the Scheduled Contract Completion Date or Revised Contract Completion Date.

When the Contractor requests home office overhead compensation for a subcontractor, use the above formula to calculate the subcontractor's daily home office overhead rate; however, in the subcontractor calculation, A is equal to the subcontractor's portion of the original contract amount as determined by the sum of all approved subcontracts issued for each individual subcontractor.

Formula items B and C are subject to verification by audit at the election of the Engineer. Any and all costs associated with the audit will be the sole responsibility of the Contractor. Information obtained through any such audit shall, if requested by the Contractor, be treated as a trade secret for purposes of exemption from disclosure under the West Virginia Freedom of Information Act.

SECTION 109
MEASUREMENT AND PAYMENT

SECTION 109.1 – MEASUREMENT OF QUANTITIES

INSERT THE FOLLOWING PARAGRAPHS AFTER PARAGRAPH ELEVEN.

AND DELETE LAST SENTENCE IN PARAGRAPH TWELVE.

Truck scales shall be provided by the producer or Contractor, except that truck scales are not required where the material is weighed at properly calibrated automatic batching plant facilities which are equipped with digital print-out equipment. The scales shall be of sufficient size and capacity to weigh the heaviest loaded trucks that are used for delivery of the material. All truck scales shall be mounted on solid foundations which will ensure their remaining plumb and level.

A weigh person shall be provided by the producer. The weigh person shall certify that the weight of the material, as determined either by the truck scales or from the digital print-out of the weights, is correct. To signify the certification of weight the weigh person must either sign their full name on each ticket, or if the ticket printer prints the weigh person's full name they must at least initial each ticket.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales. A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked so as to allow printing only when the scale has come to rest.

In case of a breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

109.6 – PARTIAL PAYMENTS:

DELETE THE SECOND PARAGRAPH IN ITS ENTIRETY AND REPLACE WITH THE FOLLOWING:

As set forth in 103.5, paragraph four, if the successful bidder submits a good and sufficient surety or collateral bond payable to the State of West Virginia in an amount equivalent to 100 percent of the contract price, an amount equivalent to two percent of the whole will be deducted from the total of the amounts ascertained as payable and will be retained by the Division until the completion of the entire Contract in an acceptable manner. The balance, or an amount

equivalent to 98 percent of the whole, less all previous payments, will be certified for payment.

DELETE THE LAST SENTENCE OF PARAGRAPH THREE AND REPLACE WITH THE FOLLOWING:

A minimum of 0.5% *(zero point five percent)* of the approximate total final contract amount will be retained until payment of the final estimate.

109.9 - PRICE ADJUSTMENT OF FUEL OIL NO. 2 (DIESEL FUEL):

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Because of the uncertainty in estimating the cost of diesel fuel that will be used during the life of this contract, adjustment in compensation for certain contract items is provided for as follows:

Product price quotations for Fuel Oil No. 2 (diesel fuel) as published by the Oil Price Information Service (**OPIS**) will be utilized to establish the contract base price as well as the monthly base price thereafter. These prices will be the average of the individual prices for the following locations:

Charleston, West Virginia
Ashland, Kentucky
Pittsburgh, Pennsylvania
Roanoke, Virginia
Marietta, Ohio

as published on the Thursday prior to the date of the first letting of the month. If the Thursday prior to the first letting date of the month falls on a holiday or the price is otherwise not published for that date, the index will be based on prices published by OPIS for the Wednesday prior to the date of the first letting of the month.

The contract base price **(Cbp)** and the monthly base price **(Mbp)** may be found posted at the Division's Internet website ***www.wvdot.com*** by selecting the ***'Contractors'*** link under ***'Doing Business'*** and then by choosing the ***'Fuel and Asphalt Prices'*** option from the ***'Contractors Resource Center'*** drop down menu.

The portion of the contract unit price which reflects the cost of the specified material will be adjusted for the change in accordance with the following formulae:

$$\mathbf{Pa = [(Mbp \div Cbp) - 1.00] \times Cbp \times C \times Q}$$

Where:

Pa	=	Price Adjustment
Mbp	=	Monthly base price at time of placement
Cbp	=	Contract Base Price at time of bidding
C	=	Cost Adjustment Factors per Unit of Contract Item Bid as outlined in chart below
Q	=	'As Constructed' Quantity

Adjustments in compensation for any period may be either plus or minus. If (Mbp) is greater than (Cbp), the adjustment will be plus. If (Cbp) is greater than (Mbp), the adjustment will be minus.

The adjustment in compensation for diesel fuel used for the listed items will be made on the separate items on the basis of the average diesel fuel requirements for processing a unit of the item as shown in the table below.

The gallons (liters) of diesel fuel for price adjustment will be determined by multiplying the usage factors listed in the table below by the amount of acceptable work performed on the separate adjustable items during an estimate period.

All adjustments will be made based on the gallons (liters) of diesel fuel indicated in the table below and no changes will be made for variations between these usage factors and the actual factors.

TABLE OF MATERIALS TO BE ADJUSTED
AND
COST ADJUSTMENT FACTORS FOR DIESEL FUEL USAGE

		UNITS	FACTOR
Class 1:	Excavation under Sections 207 and 211	Gallons per cubic yard (Liters per cubic meter)	0.25 (1.24)
Class 2:	Crushed aggregate under Sections 307, 311, and 405	Gallons per ton** (Liters per megagram)	0.62 (2.59)
Class 3:	Bituminous concrete under Sections 401 and 402	Gallons per ton** (Liters per megagram)	1.06 (4.43)
Class 4:	Rigid concrete pavement under Sections 501 and 502	Gallons per cubic yard (Liters per cubic meter)	0.76 (3.77)

** Where the pay item for aggregate is in cubic yards (meters), conversion to tons (megagrams) for the purpose of diesel fuel price adjustment will be made on the basis that one cubic yard (meter) equals 1.75 tons (2.08 megagrams).

Any difference between the checked final quantity and the sum of quantities shown on the monthly estimates for any item will be adjusted by the following formula:

$$\mathbf{FA = (FCQ \div PRQ) \times EA}$$

Where:

FA	=	Final Adjustment (dollars) for the item which increased or decreased
FCQ	=	Final Checked Quantity of the item which increased or decreased
PRQ	=	Total Quantity of said item previously reported on the most recent estimate
EA	=	Total adjustment in dollars of said item shown on most recent estimate

The monthly base price for determining price adjustments for all work performed after the contract completion date, as revised by approved time extensions, will be the monthly base price (Mbp) at the time of the contract completion date (as extended) or at the time the work was performed, whichever is less.

The final adjustment will take into consideration any error(s) that may have been made in the computation of any prior monthly adjustments.

109.10 - PRICE ADJUSTMENT OF ASPHALT CEMENT:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Because of the uncertainty in estimating the cost of petroleum products that will be used during the life of this contract, adjustment in compensation for certain contract items is provided for as follows:

The contract items listed in the Proposal in the *TABLE OF MATERIALS TO BE ADJUSTED FOR PRICE OF ASPHALT AT THE TIME OF PLACEMENT* will be adjusted in accordance with the Division's indices for asphalt cement. The bidding index **(Ib)** for asphalt cement will be equal to the placement index for the month immediately **prior to the month in which the project is bid**. The placement index **(Ip)** will be the price in effect for the month in which the specified adjustable material was actually placed. Both the bidding index **(Ib)** and the placement index **(Ip)** will be based on the average of the posted prices of PG 64-22 asphalt cement per ton/megagram as reported from the following sources:

Marathon Petroleum Company, LLC, Catlettsburg, Kentucky
Marathon Petroleum Company, LLC, Floreffe, Pennsylvania
Asphalt Materials, Inc., Marietta, Ohio
NuStar Asphalt Refining Company, Baltimore, Maryland
Associated Asphalt, Martinsburg, West Virginia

The bidding index **(Ib)** and the placement index **(Ip)** may be found posted at the Division's Internet website ***www.wvdot.com*** by selecting the ***'Contractors'*** link under ***'Doing Business'*** and then by choosing the ***'Fuel and Asphalt Prices'*** option from the ***'Contractors Resource Center'*** drop down menu.

If one of the sources listed above changes ownership and/or name the posted price for that terminal will continue in use as though the ownership and/or name change had not occurred.

If one of the sources used for determining either the bidding index or the placement index goes out of business, any future index will be based on the average of the remaining sources. Thus, the bidding index **(Ib)** could be based on the average of five sources and the placement index **(Ip)** on the average of four sources or vice-versa. If a source that goes out of business reopens at a later date, the placement index would once again be based on the average of five sources as indicated above.

The posted price for each source will be compared to the average of all sources. If the difference between the average and the individual price is greater than 25 % of the average, that individual source will be excluded from the calculation of the average price **(Ib)** or **(Ip)** and a new average will be calculated using the remaining sources.

The portion of the contract unit price which reflects the cost of the specified material will be adjusted for the change in accordance with the following formulae:

Pa = [(Ip ÷ Ib) – 1.00] x Q x Applicable "C" Factor (C1 or C2)

Where:

Pa	=	Price Adjustment
Ip	=	Price Index at time of placement
Ib	=	Price Index for Bidding
C1, C2	=	Adjustable Material Cost per Unit of Contract Item Bid
Q	=	"As Constructed" Quantity

The price index for determining price adjustments for all work performed after the contract completion date, as revised by approved time extensions, will be determined as follows: The price index (Ip) shall be for the month in which the contract completion date (as extended) alls, or the price index for the month in which the work was performed, whichever is less.

109.20-PRICE ADJUSTMENT FOR LOAD LIMIT VIOLATIONS:

DELETE THE HEADING AND CONTENTS AND REPLACE THE FOLLOWING.

109.20-LOAD LIMIT VIOLATIONS AND WEIGH TICKETS.

The Allowable Gross Weight for any vehicle being used to haul materials on publicly maintained highways under the terms of this contract shall be as follows.

Title 23 Code of Federal Regulations, Section 658.17, establishes maximum allowable gross weight on the Interstate System. The maximum allowable gross weight on WV and US Routes will be as established in Chapter 17C, Articles 17 and 17A of the Official Code of West Virginia, as amended. The Public Service Commission, Weight Enforcement Section is responsible for the enforcement of these provisions.

A weigh ticket shall be required with each load of material from a commercial source which would normally have truck scales. This includes, but is not limited to, all asphalt paving materials and all aggregates regardless of the contract pay unit. The weigh ticket shall include gross, tare, and net weights, time and date of loading, Item Number or Description of Materials, Contract Number or Project Number, number of axles on haul unit, license number of haul unit, and signature of the weigher certifying that all information on the ticket is correct. If the weigher's name is printed by the computer on the ticket, then it only needs to be initialed by the weigher.

For material from a commercial source or a batch plant, which would not normally have truck scales, a weigh ticket documenting the tare weight, number of axles on the haul unit, license number of haul unit, date weighed, location of scales, and signature of the weigher certifying that all information on the ticket is correct, may be supplied for each haul unit as an alternate to the ticket required in the previous paragraph. The tare weight ticket shall be supplied for each contract on a yearly basis and when modifications are made to the vehicle or combination of vehicles. The weight of the material delivered shall be calculated and furnished by the vendor/supplier shipping the material to the project site or DOH facility. This includes, but is not limited to, concrete, structural steel, piling, reinforcing steel and all prepackaged material of known weight, such as cement, grout, fertilizer, lime, abrasives, etc.

If the haul unit is a combination of vehicles, the license number shall be supplied for each component. The tare weight shall be for the complete haul unit.

All weighing shall be done on scales approved and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures. If the scales are moved or upon the request of the Engineer, the scales shall be reapproved and sealed. The Engineer shall be notified of any scale malfunctions. The Division of Highways may, at its option, accept inspection and sealing by out of state agencies when the material is being loaded outside West Virginia.

Any material, covered by this provision, which is delivered without the proper weigh ticket shall not be accepted by the Division of Highways.

Nothing in this provision relieves any party from compliance with the State Law on load limits or any fines which may be assessed for violation of said law.

SECTION 110
MISCELLANEOUS PROVISIONS

110.2 - MINIMUM WAGE DETERMINATIONS:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

The West Virginia Division of Labor Wage Rates and Prevailing Wage Classification Work Descriptions in effect at the time of the bid opening will become a part of the contract documents. The Contractor must post the West Virginia Division of Labor Wage Rates on the jobsite at a location accessible to employees.

The West Virginia Division of Labor Wage Rates may be found posted at the Division's Internet website www.wvdot.com by choosing the "**Contractors**" icon and under the ***Wage Rate*** heading select "**WV Division of Labor Prevailing Rates"** then select **the appropriate County** from the West Virginia Secretary of State website, or a printed version can be obtained from the Secretary of State's Office or from the West Virginia Department of Transportation, Division of Highways, Contract Administration Division or from the West Virginia Division of Labor at the following address:

West Virginia Division of Labor
Building 6, Room 749-B
1900 Kanawha Boulevard, East
Charleston, WV 25305-0570

If the Proposal contains U.S. Department of Labor Wage Rates and the wage rates established by the West Virginia Division of Labor the minimum wage paid shall be the higher rate for each job classification.

The Prevailing Wage Classification Work Descriptions may be found posted at the Division's Internet website www.wvdot.com by choosing the "**Contractors**" icon and selecting "**Prevailing Wage Classification (PDF) "** under work descriptions or a printed version can be obtain from the West Virginia Department of Transportation, Division of Highways, Contract Administration Division or from the West Virginia Division of Labor at the address listed above.

DIVISION 200
EARTHWORK

SECTION 202

DELETE SECTIONS 202 AND REPLACE WITH THE FOLLOWING:

SECTION 202
BUILDING DEMOLITION, WELL AND SEPTIC TANK ABANDONMENT

202.1 - DESCRIPTION:

This work shall consist of the demolition of buildings and the abandonment of Septic Tanks, Water Wells, Gas Wells, Oil Wells and appurtenances as are specifically designated on the Plans. It shall include rodent control, disconnecting utilities, salvaging and disposing of the resulting materials in the manner and subject to the conditions and regulations prescribed.

The Contractor shall obtain all necessary permits, bonds and licenses required for this work and must provide them to the Engineer prior to commencing the work

202.2 - UTILITIES:

The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work to the satisfaction of the utility companies and municipal departments involved in connection with the discontinuance or interruption of all public utilities or services, such as gas, water, sewage, electricity, and telephone, which may be affected by the work to be done under the demolition specified.

202.3 - DISPOSAL OF MATERIALS:

Materials resulting from demolition shall be disposed of by the Contractor at a West Virginia Division of Natural Resources approved landfill. Any material that is considered hazardous material must be disposed of at an approved site.

202.4 - BUILDINGS:

The demolition shall conform to the schedule of construction set up for the project.

Buildings and appurtenances shall be removed to the existing ground level, which operation shall include removal of concrete slabs or any other type of floor resting upon the ground. Basements shall be cleared of all debris, appliances, wood or metal partition walls, wood floors, etc., so that only the foundation walls and basement floor remain. The basement floors shall be shattered. If pits, trenches, holes, or basements are not to be eliminated in subsequent excavation operation, they shall be backfilled. All backfill within the roadway prism shall be accomplished in accordance with the requirements of Section 207. Compaction

of backfill outside the roadway prism shall be performed so as to obtain a minimum density equal to that of the surrounding ground.

202.4.1 - Rodent Control: When specified in the Contract, the following rodent control provisions shall apply.

202.4.1.2 - General: The Contractor shall furnish and place suitably prepared bait containing rodenticide in and around buildings to be demolished and shall also furnish and place insecticide for control of ectoparasites. Two rodenticide treated baits differing in content and method of placement will be required within 24 hours after receipt of notification to proceed. The Contractor shall place rodenticide treated bait within the building demolition area.

If the rodent control measures are not promptly furnished by the Contractor, the Division may provide the measures as required and deduct the cost from the money due the Contractor.

202.4.1.2 - Materials: The rodenticide treated bait shall consist of the following:

- **Type I Bait**-An anticoagulant, 0.5% concentrate, such as warfarin, pival, fumarin, PMP, etc., mixed with cereals and other rodent attractants in the following proportions by weight:

  One part anticoagulant to seven parts coarse yellow corn meal; five parts rolled oats; one part granulated sugar; one part corn oil.

  In the event rodents do not accept this formula chopped fruit may be substituted for the rolled oats in the same proportion.

- **Type II Bait**-Zinc phosphide, 100% concentrate (94 % minimum assay), mixed in the proportion of 1:96 (one ounce to six pounds) of ground meat or canned dog food.

  All rodenticides shall be handled and mixed in the bait in accordance with the manufacturers' instructions.

- **Insecticide**-Two percent Diazinion Dust, or five percent Malathion Dust, or ten percent Carbaryl Dust, or two to five percent Chlordane Dust.

202.4.1.3 - Rodent Control Operations: Type I bait containing anticoagulant shall be placed in shallow bait containers fastened to the floor surface of buildings or in shallow containers heavy enough to prevent overturning or removal to burrows. The containers shall be protected from domestic animals and weather and shall be distinctly labeled with the word Poison and symbol thereof. The initial rate of application shall not be less than four pounds of bait per 1,000 sq. ft. (2 kg per 100 square meters) of building area.

Type II bait containing zinc phosphide shall be wrapped in paper squares approximately 4 inches by 4 inches (100 by 100 mm) in size. Bait should be placed out of reach of children or pets and should be tossed in otherwise inaccessible places. Initial rate of application shall be a minimum of 20 baits per residential building and 40 baits per commercial building.

Bait shall be placed near burrows, runways, or other areas showing rodent signs. A shallow pan containing water shall be placed in each building.

At the time the bait is set out, the Contractor shall treat all runways, burrow entrances, nests and vertical surfaces against which the rodents may brush with the insecticide dust at a rate of 2 pounds (1 kg) per residential building and 4 pounds (2 kg) per commercial building.

Location of all bait, bait containers and water containers shall be noted and bi-weekly inspection and replacement of bait and water shall be made. In the event bait is not touched for several days, the bait shall be moved to other areas in the building. Moldy, wet, caked or insect infested bait shall be replaced. Insecticide dusting shall be repeated once per month.

Baiting and insecticide dusting shall continue until all buildings and rubble are removed from the building demolition area.

A sign shall be posted at the front and rear of each building treated for rodent control. The sign shall be a minimum size of 30 inches by 30 inches (750 by 750 mm) with red lettering and poison symbols on a contrasting background.

Wording of the sign shall be as follows:

THIS BUILDING
TREATED
FOR RODENT CONTROL
POISON
NO ADMITTANCE

Minimum size lettering of the word POISON and symbols thereof shall be 6 inches (150 mm). All other lettering shall be a minimum of 4 inches (100 mm). The sign shall be made of weather resistant materials such as plastic or exterior plywood and shall be securely fastened to the building.

Where buildings to be demolished have had exterior poison warning signs placed upon them during the Division's phase of the rodent control program, the signs remaining on the buildings to be demolished will serve as adequate warning and the signing requirement of this Section is waived.

Exterior poison warning signs previously placed by the Division shall, upon demolition of the buildings, remain Division property and shall be stored on the project for removal by the Division.

Dead rodents shall be removed from the building demolition area daily and shall be buried at a minimum depth of 2 ft. (600 mm). The disposal area shall be provided by the Contractor and shall be subject to approval by the Engineer.

202.4.2 - Insurance Requirements: In addition to the insurance required of the Contractor on all Division Contracts, the Contractor is required to maintain

Liability Insurance for this work in the amounts and form as set forth below for the duration of the work:

i.	Public Liability	_____	$ 1,000,000.00
ii.	Products Liability	_____	$ 1,000,000.00
iii.	Owner Liability	_____	$ 1,000,000.00

The above insurance shall be purchased by the Contractor on behalf of the Division from a company authorized to do business in the State of West Virginia.

202.5 - WELLS:

The Contractor shall plug the well prior to starting any other construction in the vicinity of the well.

202.5.1 - Materials: Materials for plugging water wells shall meet the requirements of Division 700 as follows:

MATERIAL	SUBSECTION
Bentonite	715.45
** Concrete	601

** Class D with or without air entrainment at the option of the Contractor.

202.5.2 - Gas and Oil Wells: The well shall be plugged using bentonite and cement as provided for by law, and the work shall be accomplished by a qualified service company meeting the approval of the Department of Environmental Protection office of Oil and Gas. All work pertaining to plugging the well must be performed under the supervision of the representative of the DEP office of Oil and Gas. The Contractor shall notify the Project Engineer and the DEP office of Oil and Gas at least 14 days in advance of the date on which the Contractor intends to begin work.

The Division will make available upon request copies of regulation Title 35 Series 4 and Article 6, Chapter 22 of the Gas and Oil Laws. The Contractor shall obtain a permit from DEP office of Oil and Gas and must follow all procedures prescribed in the permit.

202.5.3 - Water Wells: The Contractor shall plug all drilled water wells within the right-of-way limits prior to starting any other work in the vicinity of the wells. The well casing shall be pulled as much as practical and then filled from the bottom to the top with bentonite, concrete or a mixture of concrete and 5% bentonite to the ground surface. This operation shall be continuous.

The Contractor shall obtain a permit to abandon a water well from the County Sanitarian or State Health Department and must follow all procedures prescribed in the permit.

202.6 - SEPTIC TANKS:

A septic tank that serves a building that is being demolished shall be abandoned as follows:

The contents of the septic tank shall be removed by a licensed septic tank cleaner and the tank removed and disposed of at an approved landfill. The excavation made to remove the tank shall be backfilled with material free of sod, trash, organic substances and muck. The backfill shall be compacted as outlined in 202.4.

202.7 - METHOD OF MEASUREMENT:

The unit of measurement will be lump sum value as determined for each building to be demolished and removed, each water well abandonment, each septic tank abandonment, each gas well abandonment, or each oil well abandonment.

202.10 - BASIS OF PAYMENT:

The Building Demolition shall constitute full compensation for performing all of the requirements of this item, including furnishing all material, labor, tools, equipment, supplies, rodent control and incidentals thereto. Salvageable materials shall become the property of the Contractor, unless otherwise indicated on the Plans or in the Proposal.

The water wells, gas wells, oil wells, or septic tanks abandoned as provided above will be paid for at the contract price per each and shall be full compensation for performing all of the requirements of the item, including furnishing all material, labor, tools, equipment, supplies, permits, and incidentals thereto.

202.11 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
202001-*	BUILDING DEMOLITION NUMBER, “x” / ”y”	Lump Sum
202002-*	WATER WELL ABANDONMENT NUMBER, “x” / ”y”	Lump Sum
202003-*	SEPTIC TANK ABANDONMENT NUMBER, “x” / ”y”	Lump Sum
202004-*	GAS WELL ABANDONMENT NUMBER, “x” / ”y”	Lump Sum
202005-*	OIL WELL ABANDONMENT NUMBER, “x” / ”y”	Lump Sum

* Sequence number
x = parcel number
y = building, well, or septic tank number

SECTION 204
MOBILIZATION

204.4 - METHOD OF MEASUREMENT:

DELETE THE CONTENTS AND INSERT THE FOLLOWING:

The method of measurement will be a lump sum.

204.5 - BASIS OF PAYMENT

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Partial payments will be made as the work progresses in accordance with the following schedule.

i. 2.5% of the original contract amount or 50% of the amount bid for mobilization, whichever is less, will be released to the Contractor as the first estimate payable, not less than 15 days after the start of work at the project site.
ii. 2.5% of the original contract amount or the remaining 50% of the amount bid for mobilization, whichever is less, shall be released with the estimate payable 30 days after the first estimate.

Upon completion of all work on the project, payment of any amount bid for mobilization in excess of 5% of the original contract amount will be released.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

No deduction will be made, nor will any increase be made, in the lump sum mobilization item amount regardless of decreases or increases in the final total contract amount or for any other cause.

SECTION 206
BASE COURSE REINFORCEMENT GEOGRID

206.1 – DESCRIPTION:

This work shall consist of furnishing, testing and installing base reinforcement geogrid elements in accordance with these specifications and in reasonable close conformity with the lines, grades and dimensions shown on the plans or established by the Engineer. Design details for base reinforcement geogrid such as geogrid type, base aggregate minimum thickness, asphalt thickness and associated details shall be shown on the plans.

206.2 - REFERENCE DOCUMENTS:

ASTM Standards:

D1388	Flexural Rigidity
D4355	Practice of Sampling of Geosynthetics for Testing
D4595	Test Method of Tensile Properties of Geotextiles by the Wide Width Strip Method

Corps of Engineers:

COE	CW02215 Percent open area

Geosynthetic Research Institute:

GG1	Standard Test Method for Geogrid Rib Tensile Strength
GG2	Standard Test Method for Geogrid Junction Strength

206.3 - GEOGRID MATERIAL:

206.3.1 - General: The Contractor shall be responsible for obtaining the geogrid reinforcement materials and associated components that meet all requirements of the Specification.

Geogrid reinforcement elements shall consist of a regular network of integrally connected longitudinal and transverse polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate or other material.

206.3.2 - Certification of Materials and Submittals:

206.3.2.1 - Specification Compliance Certification: Prior to construction the Contractor shall submit to the Engineer the Manufacturer's certification that the geogrid has been evaluated in full compliance with this Specification. The Contractor's submittal package shall include; but not be limited to; the Manufacturer's written certification that all resin used to produce the geogrid is virgin and classified as polypropylene or high molecular weight polyester.

206.3.2.2 - Fitness for Use: The Manufacturer of the base reinforcement geogrid shall supply written certification that the resin and additives used in manufacture of the geogrid (including coating materials, if applicable) and that the Manufactured geogrid product has been evaluated in accordance with this specification and is durable in a soil environment. Certification shall be notarized and signed by an officer of the manufacturing company.

206.3.3 - Base Course Reinforcement Geogrid: The geogrid shall be a biaxial geogrid and shall have aperture geometry and rib and junction cross-sections sufficient to permit significant mechanical interlock with the material being reinforced. The geogrid shall have high flexural rigidity and high tensile strength at ribs and junctions of the grid structure. The geogrid shall maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service and shall also be resistant to ultraviolet degradation, to damage under

normal construction practices, and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

The geogrid shall also conform in all respects to the property requirements outlined below:

PROPERTY	TEST METHOD	UNITS	TYPE 1	TYPE 2
Interlock				
•Aperture Size[1]	I.D. Calipered[2]			
• MD		in	1.0 (nom)	1.0 (nom)
• CMD		in	1.3 (nom)	1.3 (nom)
•Open Area	COE Method[3]	%	70 (min)	70 (min)
•Thickness	ASTM D1777-64			
• Ribs		in	0.03 (nom)	0.05 (nom)
• Junctions		in	0.11(nom)	0.l6 (nom)
•Secant Aperture Stability Modulus @ 20 cm-kg	Grid Aperture Test- Univ. of Alaska, Fairbanks [4]	cm-kg/deg	3.2	6.5
Reinforcement				
•Flexural Rigidity	ASTM D1388-64[5]	mg-cm	250,000 (min)	750,000 (min)
•True Initial Modulus	GRI GG1-87[6]	lb/ft	15,000 (min)	32,000 (min)
•Tensile Strength @ 2% strain	ASTM D4595[7]	1b/ft	280 (min)	410 (min)
•Tensile Strength @ 5% strain	ASTM D4595[7]	1b/ft	580 (min)	810 (min)
•Junction Strength	GRI GG2-87[8]	lb/ft	765 (min)	1080 (min)

* All values listed are MARV's (Minimum Average Roll Values.)

Notes:

1. MD dimension is along roll length, CMD dimension is across roll width.
2. Maximum inside dimension is each principal direction measured by calipers.
3. Percent open area measured without magnification by Corps of Engineers method as specified in CW 02215 Civil Works Construction Guide, November 1977.
4. Grid Aperture Stability Test developed by Dr. T. Kinney at the University of Alaska, Fairbanks.
5. ASTM D1388-64 modified to account for wide specimen testing.

6. True resistance to elongation when initially subjected to a load measured via GRI-GG1 without deforming test materials under load before measuring such resistance or employing "secant" or "offset" tangent methods of measurement so as to overstate tensile properties.
7. True tensile strength at indicated strain levels measured via GRI-GG1 without deforming test materials under load before measuring their tensile strength so as to overstate tensile properties.
8. Geogrid junction strength as measured by Geosynthetic Research Institute test method GG2-87 "Geogrid Junction Strength".

206.3.4 - Alternate Material: Alternate geogrid materials will be considered. However, the material properties of the geogrid must be evaluated based on testing the total structure and not based on simply adding the values of the individual components/layers together. Also, no preloading or strain "offset" is permitted when reporting True Initial Modulus values as outlined in the table found in section *3.3 Base Course Reinforcement Geogrid.* Such materials must be pre-approved in writing by the Engineer prior to bid date. Alternate material packages must be submitted to the Engineer a minimum of 15 days prior to bid date. Submittal packages must include the following as a minimum:

- Full–scale laboratory testing and in-ground testing of pavement structures reinforced with the specific geogrid which quantifies the structural contribution of the geogrid to the pavement structure. The increase in the structural layer coefficient of the base course must meet or exceed that of the design geogrid.
- Independent certified test results stating that the alternate geogrid has a secant aperture stability modulus at 20 cm-kg, when tested in accordance with the "Grid Aperture Stability by In-Plane Rotation" test of 3.2 or greater for Type 1 and 6.5 or greater for Type 2.
- A list of 5 comparable projects, in terms of size and applications, in the United States, where the results of the specific alternate geogrid's use can be verified after a minimum of one year of service life.
- A sample of the geogrid and certified specification sheets.
- Recommended installation instructions.

The burden of proof that the alternate material is equal to the specified material is the responsibility of the alternate geogrid material supplier. The Engineer will be the sole judge of the adequacy of the proposed alternate geogrid.

206.4 - MANUFACTURING QUALITY CONTROL:

Conformance testing shall be performed as part of the manufacturing process. If the Manufacturer has an established quality control program, then documentation describing the program shall be submitted to the Engineer for review. As a minimum, the Manufacturer shall conduct quality control testing as outlined below:

TEST	TEST PROCEDURE	TESTING FREQUENCY (SF)
Flexural Rigidity	ASTM D1388	100,000 (9 290 m²)
Tensile Modulus	GRI GG1	100,000 (9 290 m²)
Junction Strength	GRI GG2	100,000 (9 290 m²)

The Manufacturer shall perform these tests. Samples not satisfying the specifications shall result in the rejection of the applicable rolls at no cost to the owner. At the Manufacturer's discretion and expense, additional testing of individual rolls may be performed to more closely identify the noncomplying rolls and/or to qualify individual rolls.

The Manufacturer shall certify the quality of the rolls of geosynthetic reinforcement. As a minimum, the Manufacturer shall provide quality control certificates for each batch of resin and each shift's production. These quality control certificates shall be signed by an office of the Manufacturer and supplied to the Engineer at least fourteen (14) days prior to installation of the base reinforcement geogrid.

The quality control certificate shall include:

1. Roll numbers and identification.
2. Sampling procedures.
3. Result of quality control tests, including a description of test methods used.

206.5 - TRANSPORTATION, HANDLING AND STORAGE:

The Contractor shall check the geogrid upon delivery to ensure that the proper material has been received. During all periods of shipment and storage, the geogrid shall be protected from temperatures greater than 140º F (60° C) and all deleterious materials that might otherwise become affixed to the geogrid and adversely affect its performance. Follow Manufacturer's recommendations in regards to protection from direct sunlight.

All tears, cracks, punctures or flaws to the base reinforcement geogrid coating, if applicable, shall be repaired by placing a suitable patch over the defective area as approved by the Engineer. If the substrate of a coated geogrid is exposed at roll ends or as a result of cuts, cracks, punctures or flaws, the exposed area shall be sealed with a coating solution identical to the original coating. The coating solution shall be applied by dip coating or spread coating with an applicator. The area shall be thoroughly clean and dry, and working temperatures shall not be below 32° F (0° C). All exposed substrate or repair patches shall be treated in the same manner.

206.6 – CONSTRUCTION:

A qualified and experienced representative of the geogrid manufacturer or its supplier shall be on site, for a minimum of one day at the start of installation, to assist the Contractor and the Engineer in the proper construction/installation techniques. Thereafter, the representative shall be available on an as needed basis, as requested by the Engineer, during the construction of the remainder of the project.

A quality assurance program shall be conducted by the owner's representative verifying that the product supplied to the jobsite meets the design requirements. Independent testing of field samples shall be conducted at the frequencies outlined below.

PROPERTY	METHOD	FREQUENCY (SY)
Flexural Rigidity	ASTM D1388	150,000 (13 935 m²)
Tensile	GR1 GG1	150,000 (13,935 m²)
Junction Strength	GR1 GG2	150,000 (13,935 m²)

Foundation soil shall be excavated to the lines and grades as shown on the drawings or as directed by the Engineer.

Geogrid shall be laid at the proper elevation and orientation as shown on the construction drawing or as directed by the Engineer. Correct orientation (roll direction) of the geogrid shall be verified by the Contractor. Geogrid may be temporarily secured in-place with staples, pins, sand bags or backfill as required by fill properties, fill placement procedures, or weather conditions, or as directed by the Engineer.

Base course aggregate material shall be placed in lifts and compacted as directed under Section 307. Base course aggregate shall be placed, spread and compacted in such a manner that minimizes the development of wrinkles in and/or movement of the geogrid. Tracked construction equipment shall not be operated directly upon the geogrid. A minimum fill thickness of 4 inches (100 mm) is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. Rubber tired equipment may pass over the geogrid reinforcement at slow speeds, less than 10 mph (16 km/h). Sudden braking and sharp turning shall be avoided.

Any geogrid damaged during installation shall be replaced by the Contractor at no additional cost to the Division.

206.7 - MEASUREMENT/PAYMENT:

Measurement of geogrid reinforcement is on a square yard (meter) basis and will be computed on the total area of geogrid shown on the construction drawings.

The quantity of geogrid, acceptably placed, measured as noted above, will be paid for at the contract unit price per square yard which shall be full compensation

for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete these items of work.

206.8 – PAY ITEMS:

ITEM	DESCRIPTION	UNIT
206002-*	BASE REINFORCEMENT GEOGRID, TYPE "type"	Square Yard (Square Meter)

* Sequence Number

SECTION 207
EXCAVATION AND EMBANKMENT

207.6.3 - Waste:

DELETE THE SECOND PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Before any waste will be permitted, the Contractor shall submit to the Engineer for approval four (4) copies of a site plan for any waste and/or borrow site utilized for the project. The plan for the site shall include, but not limited to:

1. The location and approximate boundaries of the waste or borrow area;
2. Topographical features including existing and final ground slopes;
3. Streams, storm water features, roads, access to properties, utilities, etc.;
4. An erosion and sediment control plan utilizing the best management practices consistent with all phases of operation of the waste or borrow site;
5. Restoration or cover vegetation plan or other DEP approved post use of the site;
6. A signed agreement between the property owner and the contractor to use the property for waste or borrow activities and DOH access to the site;
7. Letter from the WV Division of Culture and History concurring with borrow site activities at the site.

The engineer will have thirty (30) calendar days upon receipt of a completed submission to approve the site. The engineer shall be responsible to obtain WV DEP approval of the erosion and sediment control plan included with the contractor's submission. The contractor may be required to revise the site plan prior to approval of the engineer. Such plans shall be reviewed and approved before disposition of waste material is begun.

These provisions may be waived by the engineer if the contractor submits evidence that borrow materials are to be obtained from a commercial sand, gravel, or DEP approved quarry operation or the waste material is to be placed in a active DEP approved landfill. Borrow materials obtained from an active mining operation must have evidence the source is permitted by the DEP.

The DOH will bear the cost of temporary erosion and sedimentation control measures such as temporary seeding and mulching and silt fence. The contractor shall be responsible for permanent erosion and sediment control measures such as rock lined ditches, sediment traps and ponds.

Upon completion of work, all waste sites shall be neatly trimmed and drained and all debris and spoil disposed of in accordance with the approved plan. No material shall be wasted at places other than those approved, except as provided, nor shall any material be wasted above established grades of any road unless authorized by the Engineer in writing. Waste areas shall be graded, fertilized, seeded and mulched by the Contractor in accordance with the applicable Specifications.

SECTION 211
BORROW EXCAVATION

ADD THE FOLLOWING:

211.2.4 - Impervious Core: Materials shall meet the requirements specified in Section 211.3.1

211.3 - GENERAL:

DELETE THE SECOND PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

The Contractor shall make submittals and comply with 207.6.3. No borrow area shall be opened without DEP approval and is authorized by the Engineer.

ADD THE FOLLOWING AFTER THE LAST PARAGRAPH:

211.3.1 - Impervious Core: Impervious Cores shall be constructed for all sediment dams built of rock, gravel, and pervious soils.

The Impervious Core shall have the minimum dimensions as set forth in Item 5, par. 20.3.4.3.1 *Erosion and Sediment Control Manual*, West Virginia Division of Highways, latest edition.

When a key is necessary for the Sediment Dam the Impervious Core shall be made an integral part of the key. When the Impervious Core is not constructed of soil, the Core shall be anchored into the key by trenching for a minimum depth of 2 feet (610 mm).

The Impervious Core may be constructed using one of the following methods:

a) **Soil Impervious Cores:** Soil Impervious Cores may be shaped to facilitate placement and compaction. The coefficient of permeability of the soil used for the Impervious Core must be 10^{-4} cm per sec or less. A key, a minimum of 4 feet (1.2 m) in depth, must be constructed

into the original ground. The compaction of the impervious core shall be as in accordance with section 716.3.

b) **Concrete Impervious Core:** When concrete is used for the Impervious Core, Class B Concrete shall be used. The requirements of Section 601, Structural Concrete shall control the mixture and placement of the concrete. The Engineer may waive the testing of the Class B Concrete if the Concrete is from an approved plant.

c) **HDPE or LLDPE Impervious Core:** When the Impervious Core is constructed of High Density Polyethylene (HDPE) or Low Linear Density Polyethylene (LLDPE), the liner shall be manufactured to be suitable for buried conditions and may be either smooth or textured. The Contractor shall obtain recommendations from a liner manufacture for the material best suited for Impervious Core, handling, storage and construction procedures. The Manufacturer of the liner shall furnish the Engineer a Letter of Certification stating the liner is suitable for the intended use.

d) **Other Methods for an Impervious Core:** The Contractor may design and use other methods of preventing the seepage of water from the wet area. The Engineer must approve the design of the alternate method.

When the impervious core is not constructed using the Soil Impervious Core method the Contractor shall submit a plan containing construction details and materials to be used for the Impervious Core(s) for the approval of the Engineer, prior to the start of work and the purchase of any materials. This submittal will be a part of the temporary and permanent pollution control schedules and methods required by section 642.3 – Pre-construction Conference, Construction Methods, Section 642, Temporary Pollution Control, of the *West Virginia Division of Highways Standard Specifications Roads and Bridges*, latest edition.

ADD THE FOLLOWING:

211.7.4- Square Foot (Meter) Measurement: The measurement of the Impervious Core will be by the square foot (meter) of core placed and accepted by the Engineer. The area of measurement shall be calculated from the surface of a vertical plane through the centerline of the impervious core.

ADD THE FOLLOWING:

211.9- Pay Items:

ITEM	DESCRIPTION	UNIT
211017-*	Impervious Core	Square Foot (Meter)

* Sequence number

SECTION 212
STRUCTURE, ROCK, AND WET EXCAVATION

212.2 - Materials:

DELETE THE LAST SENTENCE OF PARAGRAPH ONE AND SUBSTITUTE THE FOLLOWING:

Any of the standard coarse aggregate sizes from AASHTO No. 4 through AASHTO No. 8 as shown in Table 703.4 would comply with the above gradation requirement.

DELETE THE FIFTH PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Acceptance for gradation shall be on the basis of the Contractor's written certification that the samples were obtained and tested in accordance with applicable procedures and represents the materials delivered. In the event any material does not conform to the specified gradation requirements the contractor's written certification shall reflect said nonconformance with quantities thereof. The contractor's gradation data shall be evaluated in accordance with applicable sections of Section 307 except that Table 704.6.2 shall not apply. Gradation limits shall be in accordance with Table 703.4. The certification is to include the test results.

SECTION 219
CONTROLLED LOW STRENGTH MATERIAL

219.3-PROPERTIES:

DELETE THE LAST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Flow	Minimum spread of 6 inches (152 mm)

219.4.1-Proportioning:

INSERT THE FOLLOWING AFTER THE THIRD PARAGRAPH:

The unconfined compressive strength test specimens for mix design approval shall consist of two sets (3 cylinders per set) of standard 6 inch (152 mm) by 12 inch (304 mm) cylinders. Both sets of cylinders shall be molded, cured, and tested at an age of 28 days in accordance with ASTM D4832. Both sets of cylinders shall meet the strength requirements specified in section 219.3.

219.4.2-Testing:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Material shall be sampled in accordance with ASTM D5971. Flow tests shall be conducted in accordance with ASTM D6103. Compressive strength tests shall be conducted in accordance with ASTM D4832.

The Contractor shall determine the flow, and shall mold one set (3 cylinders) of standard 6 inch (152 mm) by 12 inch (304 mm) compressive strength specimens for every 100 cubic yards (75 cubic meters), or fraction thereof, of material that is placed. These cylinders shall be cured and tested in accordance with ASTM D4832 except that they shall be stored at the construction site in the storage container until the fourteenth day after preparation. After the fourteenth day, they shall be transported to the site of the curing environment, specified in ASTM D4832, where they will be cured for the remainder of the 28 day period. The average compressive strength at 28 days shall meet the strength requirements listed in section 219.3. Material not meeting the minimum compressive strength at 28 days shall be removed at the Contractor's expense. The Division shall evaluate Type A material that exceeds the maximum compressive strength.

DIVISION 300
BASES

SECTIONS 307 AND 308

DELETE AND REPLACE WITH THE FOLLOWING:

SECTION 307
CRUSHED AGGREGATE BASE COURSE

307.1 - DESCRIPTION:

This work shall consist of furnishing, spreading, and compacting one or more courses of crushed aggregate on a prepared surface in accordance with these Specifications and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer.

The work will be accepted in accordance with these Specifications and the applicable requirements of 105, 106, and 109.

307.2 - MATERIALS:

The crushed aggregate base course shall be composed of materials meeting the requirements of 704.6 for the class shown on the Plans except that 704.6.3 shall not apply.

Class 3 material shall be used on all surface courses except that Class 10 material shall be used on all stone shoulders.

307.2.1 - Quality Control Testing: Quality control of the crushed aggregate base course is the responsibility of the Contractor as specified in 106.1.

The Contractor shall maintain equipment and qualified personnel to perform all sampling and testing necessary to determine the magnitude of the various properties of the material governed by the Specifications and shall maintain these properties within the limits of the Specifications.

The Contractor shall design a quality control plan detailing the methods by which the quality control program will be conducted. This plan, prepared in accordance with the guidelines set forth in the appropriate portions of MP 307.00.50 and MP 717.04.21, shall be submitted to the Engineer at the preconstruction conference. The work shall not begin until the plan is reviewed for conformance with the contract documents.

307.2.2 - Acceptance Testing: Acceptance sampling and testing of crushed aggregate base course is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for acceptance.

307.2.3 - Sampling and Testing: Frequency of sampling and testing shall be in accordance with the Contractor's quality control plan. The minimum frequencies shall be as indicated in applicable portions of MP 307.00.50. Crushed aggregate shall be sampled in accordance with MP 700.00.06, Aggregate Sampling Procedures.

When Sampling shoulder material for resurfacing projects that has a depth of less than 3 inches (75 mm) gradation samples may be taken from the stockpile prior to placement.

307.2.4 - Acceptance Procedure: Material conforming to the specification requirements will be accepted at full contract price. Material failing to comply with the quality requirements of Table 704.6.2 shall not be incorporated into the work.

Acceptance of crushed aggregate base course for compaction and for gradation shall be in accordance with appropriate portions of 307.2.4.1.

307.2.4.1 - Acceptance Plan:

307.2.4.1.1 - For Compaction: Acceptance for compaction shall be on a lot by lot basis. A lot shall consist of a single layer of not more than 2,000 linear ft. (600 meters) per width being placed. A lot shall be divided into five approximately equal sized sublots. One nuclear moisture and density measurement in accordance with applicable portions of 717 shall be made at a random location within each of the five sublots. The random locations shall be determined in accordance with MP 712.21.26. If the result of five density tests on

a lot indicates that at least 80 percent of the material, in accordance with 106.3.1 (West Virginia AP-A), has been compacted to the specified target percentage of dry density, the lot will be accepted. If less than 80 percent has been compacted to the specified target percentage of dry density, no additional material shall be placed on that layer until it has been reworked to meet the specified requirements. Reworking and retesting shall be at the expense of the Contractor. When the Division performs the testing in the evaluation of reworked lots, the testing will be at the expense of the Contractor at the unit cost specified in 109.2.2.

Compaction of shoulder aggregate on resurfacing projects adjacent to asphalt or concrete pavement shall be based on visual inspection to assure that the surface of the shoulder has been compacted to the level of the finished pavement surface.

Compaction of Class 7 aggregate shall be based on visual inspection to assure that the aggregate particles are arranged in a stable manner.

307.2.4.1.2 - For Gradation: Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. The material shall be sampled and tested in accordance with 307.2.3. The gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test values fall outside the limits of Table 704.6.2 the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 307.9.1. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

Acceptance for Gradation of Class 7 aggregate shall be on the basis of the Contractor's written certification that the material meets the gradation requirements. Certification shall include a description of the crushing operation indicating the screens used.

307.2.4.2 - Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming, and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 307.2.4.2 to determine the degree of nonconformance on that sieve.

TABLE 307.2.4.2

NONCONFORMING SIEVE SIZE	MULTIPLICATION FACTOR
2 in. (50 mm)	1.0
1 ½ in. (37.5 mm)	1.0
¾ in. (19 mm)	1.0
No. 4 (4.75 mm)	1.0
No. 40 (425 μm)	1.5
No. 100 (150 μm)	2.0
No. 200 (75 μm)	2.5

The total measure of nonconformance of an individual sublot is the sum of all nonconformances on the various sieve sizes of that sublot.

When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 307.9.1.

When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

CONSTRUCTION METHODS

307.3 - EQUIPMENT:

Any machine, combination of machines, or equipment which will handle the material without undue segregation and produce the completed base course meeting these Specifications for handling, spreading, moistening, mixing and compacting may be used when approved by the Engineer.

307.4 - PLACING:

Prior to the placing of any base course material on the subgrade, the subgrade shall meet the applicable requirements of 207.9 or 228. The profile grade of the subgrade shall be such that the specified thickness of the base course may be obtained. No base shall be placed when the subgrade is frozen or when it is sufficiently wet that its surface can be marred by construction equipment.

The base course shall be placed and shaped on the prepared surface in layers to achieve the compacted thickness shown on the Plans. When more than one layer is required, each layer shall be shaped and compacted to the required density before the succeeding layer is placed. Each layer shall be kept at least 500 ft. (150 meters) ahead of the succeeding layer. Tailgating will not be permitted. If power graders are used for spreading, the material shall be placed in windrows and uniformly and thoroughly mixed prior to final spreading and compaction.

On resurfacing projects the existing shoulders shall be scarified to a depth of 2 inches (50 mm) or as shown on the Plans. Subgrade soil or ditch soil shall not be mixed with the loosened material. The loosened material shall then be broken and reshaped to form a uniform grade and cross section.

Aggregate for shoulders on resurfacing projects shall be spread over the prepared surface to a width as specified in the Plans and to a depth sufficient to bring the uncompacted surface to a height of at least 1 inch (25 mm) above the finished pavement edge elevation. For compacted shoulder thicknesses exceeding 3 inches (75 mm), the differential from the pavement edge elevation must be increased to assure that the loose aggregate thickness is approximately equal to 1 1/3 times the compacted thickness. The loose aggregate is then to be shaped to proper grade and cross section maintaining the height differential.

307.5 - COMPACTING:

Each layer shall be compacted. The moisture content shall be maintained at a level sufficient to facilitate compaction. Required density and testing shall be in accordance with the provisions of the appropriate portions of 717. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates firmly keyed. The surface of the top layer of the base course shall be carefully trued by blading if necessary.

Shoulder aggregate adjacent to concrete or asphalt pavement shall be compacted by pneumatic tire rollers when the drum roller is wider than the shoulder width or as directed by the engineer.

307.6 - TOLERANCE:

307.6.1 - Surface Tolerance: The completed surface shall not vary more than 3/8 inch (10 mm) above or below Plan grade, nor more than 3/8 inch (10 mm) from a straightedge 10 ft. (3 m) long applied parallel to the centerline of the pavement. Deviations shall be corrected by scarifying, adding additional approved aggregate if necessary, reshaping, and recompacting.

Shoulder surfaces on resurfacing projects adjacent to concrete or asphalt pavement do not need to be checked with a straightedge.

307.6.2 - Thickness Tolerance: The base course shall be checked for proper thickness after final compaction. The Contractor shall refill all test holes with approved base course material and adequately recompact the material.

Any deficiency in total thickness of the base course in excess of ½ in. (13 mm) shall be corrected.

307.7 - MAINTENANCE:

The surface of the completed base shall be protected against the loss of fine material by the addition of moisture when necessary, and it shall be maintained in a satisfactory and smooth condition until such time that it is surfaced or finally accepted.

307.8 - METHOD OF MEASUREMENT:

307.8.1 - Cubic Yard (Meter) Measurement: The quantity of work done will be the number of cubic yards (meters) as established in the Proposal. Any additional work beyond the scope of the original Plans but authorized by the Engineer will be measured in cubic yards (meters) in place and paid for at the unit bid price for this item, subject to the provisions of 104.2 and 109.2.

Base course constructed outside the lines, dimensions, and cross sections shown on the Plans or designated will not be measured for payment.

307.8.2 - Ton (MG) Measurement: The quantity of work done will be the number of tons (Mg) of material complete in place and accepted.

The number of tons (Mg) shall be determined by the total of the weights shown on receipted railroad freight bills when materials are shipped by rail; by actual measured displacement of barges certified by the producer when water shipments are made, providing materials delivered by the methods are not stockpiled or stored; or determined by the Contractor from the total of weigh slips for each vehicle load weighed on an approved standard scale or from digital printout slips from an automatic batching plant, and certified by the Contractor to be correct.

Truck scales shall be provided by the producer or Contractor, except that truck scales are not required where the material is weighed at properly calibrated automatic batching plant facilities which are equipped with digital print-out equipment. The scales shall be of sufficient size and capacity to weigh the heaviest loaded trucks that are used for delivery of the material.

All truck scales shall be mounted on solid foundations, which will insure their remaining plumb and level. All truck scales shall be inspected and sealed by the West Virginia Division of Labor, Bureau of Weights and Measures, or other appropriate agencies of the State or its political subdivisions. The Division may, at its option, accept inspection and sealing by out of state agencies when the material is weighed outside West Virginia.

The producer shall provide a weigh person. The weigh person shall certify that the weight of the material, as determined either by the truck scales or from the digital printout of the weights, is correct.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales. A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked so as to allow printing only when the scale has come to rest.

In case of a breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

When reconditioning surface with aggregate is specified it shall include the cost of all surface reconditioning work.

307.9 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the items listed below, which price and payment shall be full compensation for furnishing all the materials including water for compaction, scarification and manipulation of existing surface, and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

307.9.1 - Price Adjustment: Aggregates not conforming with the gradation requirements as described in 307.2.4.1 will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 307.9.1.

TABLE 307.9.1

ADJUSTMENT OF CONTRACT PRICE FOR GRADATION NOT WITHIN SPECIFICATIONS	
Degree Of Nonconformance	**Percent Of Contract Price To Be Reduced**
1.0 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

* The Division will make a special evaluation of the material and determine the appropriate action. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

307.10 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
307001-*	AGGREGATE BASE COURSE, CLASS "class"	Cubic Yard (Meter)
307005-*	AGGREGATE BASE COURSE, "aggregate type", CLASS "class"	Ton (Megagram)

* Sequence number
"aggregate type" shall be either stone and gravel, slag or steel slag
"class" From Table 704.6.2A and B

SECTION 311
OPEN GRADED FREE DRAINING BASE COURSE

311.5 - TESTING:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

311.5.1 - Quality Control Testing: Quality control is the responsibility of the Contractor as specified in 106.1.

The contractor shall design a quality control plan detailing the methods by which the quality program will be conducted. The Contractor shall conduct one test daily to determine mix properties in accordance with 311.4. Frequency will be one test per day. Acceptance for gradation will be in accordance with section 703.6. If gravel is used for the coarse aggregate a crushed particle analysis, in accordance with Section 311.2 will be conducted before placement and every 10,000-ton (9000-mg) thereafter. Unless otherwise specified compaction testing shall be waived.

311.5.2 - Acceptance Testing: Acceptance sampling and testing of aggregates is the responsibility of the Division, except for furnishing the necessary materials. The Division may use quality control sampling and testing performed by the Contractor for Acceptance.

311.6 - WEATHER AND SEASONAL LIMITATIONS:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

Weather and seasonal limitations shall be in accordance with 401.8 for asphalt applications. Portland cement base shall not be mixed or placed while the temperature of the course on which the material is to be placed is below 40° F (4° C). When conditions indicate that the temperature of the in-place material may fall to less than 35° F (2° C) within 24 hours, adequate means satisfactory to the Engineer shall be provided for the protection of the work. In no instance shall the mix be placed on frozen subgrade.

311.7 - EQUIPMENT:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

Depending on the alternative used, equipment shall meet the applicable requirements of 401.9 or 501.5 – whichever is appropriate.

311.8 - PREPARATION AND BATCHING OF MATERIALS:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

All aggregate shall be dried until it has no surface moisture and not more than 0.5 percent of absorbed moisture. Mixing temperature of aggregate shall be as directed and shall range between 225° - 300° F (107° -149° C).

Bituminous material shall be heated in melting kettles or tanks designed to secure even heating of the mass. Heating temperatures shall be as directed and shall range between 250° - 275° F (120° - 135° C).

The temperature of the mix shall be within the range of 200° - 250° F (95° - 120° C).

Preparation of materials for Portland cement applications shall conform to the requirements of 501.7.

311.9 - MIXING AND TRANSPORTING REQUIREMENTS:

DELETE THE FIRST PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

The materials used in asphaltic mixes shall be mixed in a asphalt concrete mixing plant that has been inspected and approved by the Division. Transportation of such mixes shall be in accordance with 401.09.7 of the Specifications.

311.12 - TOLERANCE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Thickness tolerance shall meet the requirements of 307.6.2.

SECTION 314
AGGREGATE SUBBASE

DELETE THE ENTIRE SECTION.

DIVISION 400
BITUMINOUS PAVEMENTS

SECTION 401
HOT-MIX ASPHALT BASE, WEARING, AND PATCHING AND LEVELING COURSES

DELETE THE ENTIRE SECTION AND INSERT THE FOLLOWING:

SECTION 401
HOT-MIX ASPHALT BASE, WEARING, AND PATCHING-AND-LEVELING COURSES

401.1 - DESCRIPTION:

This work shall consist of constructing one or more courses of hot-mix asphalt (HMA), mixed mechanically in a plant, composed of aggregate and asphalt material designed in accordance with either the Marshall or Superpave Design

System as specified in the contract documents, on a prepared foundation in accordance with these specifications and in reasonable close conformity with the lines, grades, weights or thicknesses, and cross sections shown on the Plans or established by the Engineer.

The unit of measurement for HMA will be by the ton (megagram), square yard (square meter) or cubic yard (cubic meter).

The work will be accepted in accordance with these Specifications and the applicable requirements of Sections 105, 106, and 109.

401.2 - MATERIALS:

The materials shall conform to the following requirements:

MATERIAL	SUBSECTION	PG BINDER GRADE
Performance Graded Binders	705.5	Standard grade shall be a PG 64-22. PG 70-22** shall be used on projects specified with over 20 million ESALs. Any deviation from the above criteria will be specified in contract documents.
Coarse Aggregate	703.1 thru 703.3 * and *** (See MP 401.02.28 for exceptions and additions required for Superpave Items.)	
Fine Aggregate	702.3 (See MP 401.02.28 for additions required for Superpave Items)	
Mineral Filler	702.4	

* The total shale, coal and other lightweight deleterious material and friable particles shall not exceed 3%.

** PG 64-22 Binder may be used in HMA placed below the top two lifts. Scratch course and patching-and-leveling are not identified as lifts.

*** When slag is specified in the contract, the coarse aggregate shall be slag which meets the requirements of 703.3, except as amended in this subsection.

CONSTRUCTION METHODS

401.3 - GENERAL:

Construction methods to be used in performing the work shall be submitted to the Engineer for review prior to the start of work. This review may require modification of the proposed methods to provide the desired end product. All equipment, tools, machinery, and plant shall be maintained in a satisfactory working condition.

401.4 - COMPOSITION OF MIXTURES:

401.4.1 - General: The aggregate for use in the designated mixture shall consist of a mixture of aggregate (coarse, fine, reclaimed asphalt pavement (RAP) if desired, or mixture thereof) and mineral filler if required. It shall be the responsibility of the Contractor to determine the percentage of RAP to be used in the mix. The amount and grade of virgin PG Binder to be used in the RAP designs shall be determined in accordance with Materials Procedure (MP) 401.02.24.

401.4.2 - Job Mix Formula: Job Mix Formula (JMF) is the specification for a single mix produced at a single plant. This mix may be specific to a single project or be used on multiple projects if the basic design criteria (design compaction level and PG Binder grade) are the same.

The Contractor shall submit a proposed JMF for each combination of aggregate and asphalt material for each type of HMA to be produced. Depending on the design type, the JMF gradations shall be within the tolerances set forth in either Table 401.4.2A or Table 401.4.2B. Marshall mix designs shall be developed in accordance with MP 401.02.22. Superpave mix designs shall be developed in accordance with MP 401.02.28.

Each proposed JMF must be documented on the Division Form T400 or T400SP and the entire JMF package shall be forwarded for review to the District Materials Engineer/Supervisor. The T400/T400SP and JMF package shall then be transmitted to the Materials Control, Soils and Testing Division for final review. If the JMF requires revision, it will be returned to the designer through the District. The T400/T400SP Form shall contain the following information:

i. Identification of the source and type of materials used in the design.
ii. The aggregate blend percentages and the percentage for each sieve fraction of aggregate considered the desirable target for that fraction.
iii. The percentage of asphalt binder representing the optimum asphalt content for the JMF submitted, which is to be considered the desirable target percentage.
iv. The temperature of the completed mixture at the plant which shall be within ± 25° F (± 14° C) of the median mix temperature established by the temperature-viscosity chart or as recommended by the asphalt supplier.
v. The ratio (calculated to the nearest one-tenth percent) of the Fines to Asphalt (FA). For Marshall mixes the ratio is defined as the percentage of aggregate passing the No. 200 (75 μm) sieve, divided by the percentage of asphalt content calculated at the percentage optimum asphalt content of the design. For Superpave mixes the ratio is defined as the percentage of aggregate passing the 75 μm (No. 200) sieve, divided by the percentage of effective asphalt content calculated at the percentage optimum asphalt content of the design.

DELETE TABLES 401.4.2A AND 401.2B AND REPLACE WITH THE FOLLOWING:

TABLE 401.4.2A
DESIGN AGGREGATE GRADATION REQUIREMENTS
FOR MARSHALL MIX DESIGNS

TYPE OF MIX	Base-I	Base-II (Patch & Level)	Wearing-IV	Wearing-I (Scratch-I)	Wearing-III (Scratch-III)
SIEVE SIZE	Nominal Maximum Size				
	1 ½ in (37.5 mm)	¾ in (19 mm)	¾ in (19 mm)	3/8 in (9.5 mm)	No. 4 (4.75 mm)
2 in (50 mm)	100	–	–	–	–
1 ½ in (37.5)	90 - 100	–	–	–	–
1 in (25 mm)	90 max	100	100	–	–
¾ in (19 mm)	–	90 – 100	90 – 100	–	–
½ in (12.5 mm)	–	90 max	90 max	100	–
3/8 in (9.5 mm)	–	–	–	85 - 100	100
No. 4 (4.75 mm)	–	–	47 min	80 max	90 - 100
No. 8 (2.36 mm)	15 – 36	20 – 50	20 – 50	30 – 55	90 max
No. 16 (1.18	–	–	–	–	40 - 65
No. 30 (600 µm)	–	–	–	–	–
No. 50 (300 µm)	–	–	–	–	–
No. 200 (75 µm)	1.0 – 6.0	2.0 – 8.0	2.0 – 8.0	2.0 – 9.0	3.0 – 11.0

TABLE 401.4.2B
DESIGN AGGREGATE GRADATION REQUIREMENTS
FOR SUPERPAVE MIX DESIGNS

Type of Mix	37.5	25	19 Note (Patch & Level)	12.5	9.5 (Scratch)	4.75 (Scratch)
Standard Sieve Size	Nominal Maximum Size					
	37.5 mm (1 ½ inch)	25 mm (1 inch)	19 mm (3/4 inch)	12.5 mm (1/2 inch)	9.5 mm (3/8 inch)	4.75 (No. 4)
50 mm (2”)	100	–	–	–	–	–

37.5 mm (1½")	90 – 100	100	–	–	–	–
25 mm (1")	90 max	90 – 100	100	–	–	–
19 mm (3/4")	–	90 max	90 – 100	100	–	–
12.5 mm (1/2")	–	–	90 max	90 – 100	100	100
9.5 mm (3/8")	–	–	–	90 max	90 – 100	95 – 100
4.75 mm (No.4)	–	–	–	–	90 max	90 – 100
2.36 mm (No.8)	15 – 41	19 – 45	23 – 49	28 - 58	32 - 67	
1.18 mm (No.16)	–	–	–	–	–	30 – 60
600 µm (No.30)	–	–	–	–	–	–
300 µm (No. 50)	–	–	–	–	–	–
75 µm (No.200)	0.0 – 6.0	1.0 - 7.0	2.0 – 8.0	2.0 - 10.0	2.0 - 10.0	6.0 – 12.0

Note: When a 19 mm mix is specified for use as a heavy duty surface mix, it shall be designed as a fine graded mix with the additional requirement of a minimum of 47% passing the 4.75 mm (No.4) screen.

If it becomes necessary to change aggregate sources, a new mix design shall be developed and submitted for approval. When using neat (unmodified) PG Binders, the binder source may be changed without requiring a new mix design, but the binder grade must always remain the same for each design. If a source change results in the use of an additive- enhanced modified binder of the same grade, a new mix design will be required.

If a modified binder source is changed or if the modification process is changed, a new mix design shall be developed and submitted for approval. A source change to a new location with the original manufacturer/supplier and the original modification process will not require a new mix design.

At no time shall different grades of PG Binders be mixed together in the same storage tank. When it is necessary to switch to a new binder grade the tank shall be drawn down as far as possible, normally to the top of heating coils, before refilling with the new binder. The new binder shall be circulated thoroughly before restarting production.

401.5 - TESTING:

401.5.1 - Test Methods:

MP 700.00.06	Aggregate Sampling Procedures
AASHTO T168	Sampling Hot-Mix Asphalt
AASHTO T11	Materials Finer than No. 200 (75 μm) Sieve in Mineral Aggregates by Washing
AASHTO T27	Sieve Analysis of Fine and Coarse Aggregates
AASHTO T30	Mechanical Analysis of Extracted Aggregate
AASHTO T164	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
AASHTO T287	Asphalt Content of Bituminous Mixtures by the Nuclear Method
AASHTO T308	Asphalt Content of HMA by the Ignition Method (Test Method A)
AASHTO T245	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
ASTM D5581	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (For Base-I Marshall designs only)
AASHTO T166	Bulk Specific Gravity of Compacted Bituminous Mixtures
AASHTO T209	Maximum Specific Gravity of Bituminous Paving Mixtures
AASHTO T269	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
AASHTO TP4	Determining the Density of HMA Specimens by Means of the Superpave Gyratory Compactor

401.6 - CONTRACTORS QUALITY CONTROL:

401.6.1 - Quality Control Testing: Quality control of HMA is the responsibility of the Contractor. The Contractor shall maintain equipment and qualified personnel including at least one certified HMA technician at each plant. The technician shall be in charge of all plant quality control activities such as mix proportioning and adjustment and all sampling and testing activities necessary to maintain the various properties of HMA within the limits of the specification. A certified HMA inspector may handle sampling and testing activities under the supervision of the plant technician.

The Contractor shall maintain equipment and qualified personnel including at least one certified Compaction Technician at each project. A certified Compaction Technician shall perform all testing necessary to assure compaction of the HMA meets specification requirements. The Contractor, or Contractor-Producer, shall design a workable Quality Control Plan, detailing the type and frequency of sampling and testing deemed necessary to measure and control the

magnitude of the various properties of the HMA governed by these specifications. This plan, prepared in accordance with MP 401.03.50 shall be submitted to the Engineer for review prior to production of material under this specification.

401.6.2 - Job Mix Formula Field Verification: For each JMF, a mix design field verification shall be conducted during the first days of plant production. For Marshall designs, the verification shall be in accordance with the guidelines established in MP 401.02.27. For Superpave, designs it shall be in accordance with MP 401.02.29. The field verification is for the purpose of demonstrating that the JMF can be produced within the specified tolerances set forth in the MP. If the mix cannot be produce within these requirements, a new mix design will be required.

401.6.3 – Quality Control Testing Requirements: After the JMF design field verification has been successfully completed, sampling frequency and test requirements for quality control shall be as set forth in MP 401.02.27 for Marshall designs and MP 401.02.29 for Superpave designs. If the Division determines that a mix cannot be consistently produced within the tolerance limits of the specified design properties, approval of the mix may be revoked and the contractor will be required to provide a new mix design.

401.7 - ACCEPTANCE TESTING:

401.7.1 - Acceptance Testing of HMA: Acceptance testing of HMA is the responsibility of the Division. For Superpave mixes, the acceptance sampling and testing requirements for the mixture shall be as set forth in MP 401.02.29.

401.7.2 – Surface Tolerance: It is the intent of these specifications that projects with a total new pavement thickness of 3 inches (75 mm) or more and minimum length of two lots (1100 ft (340 m)) shall be constructed to provide a smooth riding surface. The smoothness of the riding surface will be determined by the Engineer using an inertial profilometer or Mays Ride Meter. The smoothness testing will generally be accomplished within 30 days after the project is complete. On urban projects with numerous side streets where traffic must cross through the paving operation, the Engineer shall determine if it is practical to evaluate the pavement for smoothness.

The pavement will be divided into sampling LOTS of one-tenth (0.1) lane-mile (0.16 km) each. Each LOT shall exhibit a smoothness measurement, expressed in inches per mile (millimeters per kilometer) equal to or less than that shown in the appropriate Table 401.7.2E or 401.7.2M. When a LOT is represented by a smoothness number greater than that shown in Tables 401.7.2E or 401.7.2M, the unit price shall be adjusted as in 401.13.2.

TABLE 401.7.2E

Total New Pavement Thickness	Smoothness
3 inches to 4 inches	81 inches per mile or less
4 inches or greater	65 inches per mile or less

TABLE 401.7.2M

Total New Pavement Thickness	Smoothness
75 mm to 100 mm	1 250 mm/km or less
100 mm or greater	1 000 mm/km or less

When compaction is completed on the course, it shall present a uniform surface, true line and grade, conforming to the cross section shown on the Plans. When tested with a straightedge of approximately 10 feet (3 meters) in length and a template of the specified dimensions, the finished base course shall not show a deviation greater than ¼ inch (6 mm) and the finished wearing course shall not show a deviation from the required surface greater than 3/16 inch (5 mm).

The Contractor shall provide the straightedge and template for checking the surfaces and an employee to use them under the direction of the Engineer. Any irregularity of the surface exceeding the limits specified shall be corrected. Depressions which develop after the initial rolling shall be corrected by loosening the mixture and adding new material. High places shall be corrected by removing excess material.

Areas of completed courses found to be defective shall be removed and replaced with approved mixtures laid in accordance with these specifications, and no additional compensation will be allowed for materials used or work involved in replacing defective areas.

401.7.3 - Compaction: Acceptance testing for compaction shall be performed in accordance with either the Lot-by-Lot method described in Section 401.7.3.1 or the rollerpass procedure described in MP 401.05.20, based on the total new pavement thickness and the lift thickness provided in Table 401.7.3A. Patching-and-leveling and scratch courses shall not be included in determining the total new pavement thickness. When HMA is placed in areas that require a nonuniform thickness or is tapered to a thin edge, the method of acceptance testing shall be determined by the Engineer. Acceptance testing is not required on areas in which a full-size roller is restricted from properly compacting the mat. These areas shall be compacted to the satisfaction of the Engineer.

Table 401.7.3A
Mainline Compaction Methods

Traffic Type	Total New Pavement Thickness	Marshall Lift Thickness	Superpave Lift Thickness	Compaction Method *
Heavy ≥ 3 million ESALs	≥ 2.5 inches (63 mm)	≥ 1 inch (25 mm)	≥ 1.25 inch (32 mm)	Lot-by-Lot
		< 1 inch (25 mm)	< 1.25 inch (32 mm)	Rollerpass
Heavy ≥ 3 million ESALs	< 2.5 inches (63 mm)	> 1 inch (25 mm)	> 1.25 inch (32 mm)	Lot-by-Lot
		≤ 1 inch (25 mm)	≤ 1.25 inch (32 mm)	Rollerpass
Medium < 3 million ESALs	≤ 3.0 inches (75 mm)	> 1 inch (25 mm)	> 1.25 inch (32 mm)	Lot-by-Lot
		≤ 1 inch (25 mm)	≤ 1.25 inch (32 mm)	Rollerpass
Medium < 3 million ESALs	< 3.0 inches (75 mm)	All lifts	All lifts	Rollerpass

* Any lift that is placed at a thickness of less than two times the nominal maximum aggregate size, as specified in either Table 401.4.2A or Table 401.4.2B, shall be compacted using the rollerpass method.

Table 401.7.3B
Other Compaction Situations

Procedure	Construction Situation	Compaction Method
Shoulders	New Construction	Lot-by-Lot
	Overlay Projects	Rollerpass
Shoulders With Rolled-In Rumble Strips	Surface Course Only	See Section 401.7.3.2
Trench Paving	All	Rollerpass or Satisfaction of the Engineer
Pavement Widening	All	Rollerpass or Satisfaction of the Engineer
Pavement Repairs	All	Rollerpass or Satisfaction of the Engineer

401.7.3.1 – LOT-By-LOT Testing: Randomly located nuclear density tests will be performed in accordance with the LOT-By-LOT test procedure described in MP 401.05.20. The pavement shall be divided into LOTS not exceeding 1000 feet (300 meters) of paving lane. A randomly located density test shall be conducted in each LOT. The density shall be within the range of 92 to 96% of the maximum density of the approved mix design or the maximum density established under Section 401.6.2, Job Mix Formula Verification. If the density is outside the range, an additional five tests shall be conducted for the LOT and the average of these five tests used to judge acceptance of the LOT in accordance with Table 401.13.3.

401.7.3.2 – Shoulders With Rolled-In Rumble Strips: On both new construction and overlay projects, the compaction requirement for the surface course of the shoulder shall be in accordance with the rollerpass procedure described in MP 401.05.20. However, the number of roller passes may be reduced in the area of the rolled-in rumble strip to allow for the proper placement of the rumble strip.

401.7.4 – Thickness: When a uniform thickness of three inches (75 mm) or more is specified, excluding resurfacing, cores shall be taken to verify the thickness of the compacted pavement.

Cores will be taken by the Division at random locations. The sampling frequency shall be approximately five cores per 2,000 feet (600 meters) of two-lane construction, except that the sampling frequency shall normally be limited to a minimum of five and a maximum of 50 cores per project. The Division may elect to waive coring for short projects of less than 1,000 feet (300 meters) in length or for projects where a paving mat of uniform thickness cannot be expected (for example: tapered paving mats or pavement widening projects). The Division may also elect to take additional cores when needed to resolve problems related to pavement thickness.

The thickness shall be considered acceptable if one or both of the following criteria are met:

(A) The average thickness equals or exceeds the specified thickness.
(B) The average thickness is less than the specified thickness, but the difference is not statistically significant at the 95% confidence level. (Standard one tail "t" test at 0.05 significance).

The calculated 't' value shall be less than or equal to the standard 't' value at the 95% confidence level. The method for calculating Criteria 'B', shall be as follows:

$t \leq t_{95}$ Where:

t_{95} = value from standard "t" table for 95% confidence level.

$$t = \frac{x_s - \bar{x}}{s}\sqrt{n-1}$$

x_s = specified thickness

$\bar{x}$ = average thickness

n = number of samples

$$s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$$

x = individual core thickness

If the average thickness is less than specified and is determined to be significant as determined by criteria 'B', the Division shall decide on a course of action as described in Section 401.13.4.

401.8 - WEATHER RESTRICTIONS:

HMA shall only be placed when the surface is dry and when weather conditions are such that proper handling, finishing, and compaction can be accomplished. In no case however, shall HMA be placed when the surface temperature is below the minimum established in Table 401.8.

TABLE 401.8	
Course Thickness	**Minimum Surface Temperature**
3 inches (75 mm) and over	35 °F (2 °C)*
1.5 to 2.9 inches (38 to 74 mm)	40 °F (4 °C)
Less than 1.5 inches (38 mm)	50 °F (10 °C)

* In lieu of 35 °F (2 °C), a minimum air temperature of 40 °F (4 °C) shall be used when paving directly on an aggregate base, subbase, or subgrade.

In addition to the above surface temperature requirements, no wearing courses shall be placed when the air temperature is less than 40° F (4° C).

401.8.1 - Cold Weather Paving: When the air temperature falls below 50° F (10° C) or the surface temperature falls below 60° F (15° C) the provisions for cold weather paving shall apply.

Paving shall be performed so that the transverse joints in adjacent lanes shall be no more than 50 feet (15 meters) apart at the end of each day's paving operations.

The surface temperature shall be taken a minimum of once every hour and shall be taken in all shaded areas. The temperature requirements as listed in Table 401.8 shall apply.

It shall be the Contractor's responsibility to monitor the declining surface temperature to insure that material delivery from the plant be terminated so as to allow that all material can be placed prior to the surface temperature falling below the surface temperatures listed in Table 401.8.

The temperature of the delivered material and the mat temperature at the time final density is obtained shall be taken for every truck load. These temperatures shall be in accordance with Section 401.10.3 for delivered material and 401.10.4 for the mat temperature at the time final density is obtained.

401.9 - EQUIPMENT:

401.9.1 - Plants: All plants in West Virginia producing HMA for the Division shall provide documented evidence of compliance with current requirements of the West Virginia Air Pollution Control Commission.

All plants which are not in West Virginia but producing HMA for the West Virginia Division of Highways shall provide documented evidence of compliance with current requirements of the laws and regulations of the State in which they are producing, applicable to air pollution. All plants shall meet the general requirements set forth in AASHTO M156 unless it can be demonstrated to the satisfaction of the Engineer that a consistent quality mix can be produced with modifications to any of these requirements.

401.9.2 - Dust Collector: An efficient dust collecting system shall be provided to prevent the loss of fine material. The material collected may be returned to the mixture at a uniform rate or discarded.

401.9.3 - Truck Scales: Truck scales shall be provided at each Plant, except that truck scales are not required at properly calibrated automatic batching plant facilities which are equipped with digital printout equipment, and which load the trucks directly from the mixer or the weigh hopper in a surge or storage bin.

A person designated as a weigher shall be provided by the producer. The weigher shall certify that the weight of the HMA, as determined either by the truck scales or from the digital printout of the batch weights, is correct.

Each truck shall be weighed empty prior to each load, except at automatic batch plants approved to operate without truck scales.

All truck scales shall be mounted on solid foundations which will insure them remaining plumb and level.

Approval and sealing of scales shall be conducted at the frequency determined by the West Virginia Division of Labor, Bureau of Weights and Measures, and when the plant is moved, or upon the request of the Engineer. The Engineer shall be notified of any scale malfunctions when material is being furnished to Division of Highways projects. The Division may, at its option, accept inspection and sealing by out-of-state agencies when the mixing plant is located outside West Virginia.

A digital recorder shall be required on all truck scales. The digital recorder shall produce a printed record of the gross, tare and net weights, and the time, date, truck identification, and project number. Provision shall be made for constant zero compensation and further provision shall be made so that the scales may not be manually manipulated during the printing process. The system shall be interlocked so as to allow printing only when the scale has come to rest. In case of breakdown of the automatic equipment, the Engineer may permit manual operation for a reasonable time, normally not to exceed 48 hours, while the equipment is being repaired.

The scales shall be of sufficient size and capacity to weigh the loaded trucks that are used for delivery of HMA from the plant.

401.9.4 - Test Weights: As part of its standard equipment, each plant which proportions aggregate by weight shall provide a minimum of ten 50-pound (22.68 kg) test weights for the purpose of maintaining the continued accuracy of its weighing equipment.

Plants which proportion asphalt material by weight shall furnish, in addition to the above, one five pound (2.268 kg) test weight.

401.9.5 - Surge and Storage Bins: During the normal daily operation of the plant, HMA may be stored in a surge or storage bin for a maximum of 12 hours, provided the bin has received prior evaluation and acceptance through the District plant inspection. The resulting temperature of the material at time of placement and compaction shall be sufficient to comply with 401.10.3 and 401.10.4

Longer silo storage times, up to 24 hours, may be permitted for dense graded HMA if the storage silo is insulated and/or heated to assure that the proper mix temperature is maintained. The gates at the bottom of the storage silo shall be adequately heated and sealed when the HMA is held for the extended period of time. An inert gas system may be used to purge the silo of oxygen to prevent oxidation of the asphalt. The HMA delivered from the storage silo shall meet all of the specification requirements.

When HMA is stored for the extended time period, it shall not be used until the temperature has been checked and the HMA has been visually inspected for hardening of the mix and stripping of the asphalt from the aggregate. Approval of the extended storage time may be revoked if it is determined through inspection and/or testing that the extended storage is having a detrimental effect on the HMA.

Loading of trucks through the storage bin will only be permitted when a minimum 25-ton (23-Mg) buffer of material is being maintained or an amount as recommended by the bin manufacturer, means shall be provided for loading the trucks directly from the mixer when the storage bin is not in operation.

401.9.6 - Inspection of Equipment and Plant Operations: The Engineer shall have access to the plant to assure the adequacy of the equipment in use, to inspect the conditions and operation of the plant, to verify weights, to verify the proportion and character of materials, and to determine if specified temperatures are being maintained in the preparation of the mixture.

401.9.7 - Trucks for Transporting Mixture: The inside surfaces of trucks shall be thinly coated with a soapy water or a mixture with not more than ten percent lubricating oil. The use of diesel fuel, kerosene, or similar solvent-based products which can dissolve the asphalt film from the aggregate particles will not be permitted. Any commercial release agent which can be certified as harmless to the mix may be used; however, the Division reserves the right to restrict any release agent that is shown to cause problems during placement of the mix. In the case of mixtures composed of PG Binders which contain polymer modification, truck surfaces should be coated with a release agent recommended by the binder supplier. All excess coating material shall be removed from the truck bed prior to loading the HMA.

All truck beds shall be insulated with approved material. No trucks shall be used which cause segregation of the materials, which show large oil leaks, or which cause undue delays in delivery of material. All trucks shall be provided with a waterproof cover and a hole in the body for the purpose of conveniently checking the temperature of the load. Covers shall be suspended slightly above the mixture, shall extend over the sides of the truck, and shall be securely fastened to eliminate air infiltration and to prevent water from coming in contact with the mixture.

401.9.8 - Laboratory: A testing facility or laboratory, as described below, shall be provided within reasonable proximity of the HMA plant. Plant operations must be visible from within the laboratory.

The laboratory shall be of sufficient size to hold all laboratory test equipment and supplies with adequate floor space to allow the technicians to test samples in an efficient manner. The laboratory shall be furnished and maintained with adequate ventilation, heat, light, water, sink and drainage, electrical or gas outlets, or both, work table, shelves, and supply cabinets.

The laboratory shall be supplied with the equipment and materials listed below and these shall be maintained to meet the applicable requirements of AASHTO or ASTM:

i. Hot plate, gas or electric.
ii. Large ovens (as needed for heating and drying samples), gas or electric.
iii. Unit weight container, ½ cubic foot (0.014 cubic meter). Required for slag only.
iv. Balances of sufficient capacity and accuracy for conducting specified tests and plant calibration.
v. Thermometers, dial type and glass, as required for conducting standard test procedures and monitoring mix temperatures.
vi. Standard Gilson shaker or equivalent, with screens.
vii. Ro-Tap shaker or equivalent, with 8 and/or 12 inch (200 and/or 300 mm) diameter screens.
viii. Sample splitters for fine and coarse aggregates.
ix. Miscellaneous items (including sample splitting trowels, scoops, square point shovel, aggregate sample pans, heat resistant gloves, measuring rules, brushes, flashlight, and glassware as needed).
x. Expendable supplies necessary for performance of tests.
xi. Equipment for determining the maximum specific gravity of asphalt mixtures as specified in AASHTO T209.
xii. Equipment for determining the in-place density of asphalt mixtures meeting the requirements of MP 401.05.20.
xiii. Non-contact infrared thermometer accurate to ± 2° F (± 1° C).
xiv. Equipment for determining the bulk specific gravity of HMA using saturated surface dry specimens complying with AASHTO T166.
xv. Marshall equipment necessary to comply with AASHTO T245 and ASTM D5581, including a calibrated automatic testing apparatus having recording capabilities and compaction hammers. (Marshall designs only)
xvi. Asphalt content ignition oven with built-in scale and printer meeting the requirements of AASHTO T308, Test Method A. (Optional for Marshall designs – Mandatory for Superpave designs)
xvii. Calibrated Gyratory compactor meeting requirements of AASHTO TP4 with computer (including software for data acquisition and test calculations) and printer. Compactor must be a model which has been evaluated and approved for use by either the National Asphalt Training Center or one of the Superpave Regional Centers using the standard protocol developed by the Federal Highway Administration Superpave Mixture Expert Task Group. Proof of calibration within last six months shall be presented to the District before testing can begin on the first project of the paving season. (Superpave designs only)

401.9.9 - Spreading Equipment: Spreading equipment shall be self-contained and of sufficient size, power and stability to receive, distribute and strike-off the asphalt mixture at rates and widths commensurate with the typical sections and other details shown on the plans. The spreading equipment shall be provided with an activated screed or strike-off assembly equipped to be heated. Approval of spreading equipment by the Engineer will be based on the demonstrated capability of the equipment to place the mixture to the required cross-section, profile and alignment in an acceptable, finished condition ready for compaction. Specialized equipment or hand methods approved by the Engineer may be employed to spread the asphalt mixture where the use of standard full scale spreading equipment is impractical due to the size or irregularity of the area to be paved.

Paving machines shall be equipped with mechanical or automatic grade and slope controls. The use of automatic grade and slope controls with a traveling straight edge shall be required only when specified on the Plans or in the Proposal. Both the grade and slope controls shall be in working order at all times. In the event of failure of the automatic controls, the Contractor will be permitted to finish the day's work using manual controls but will not be allowed to resume work the following day until the grade and slope controls are in proper working order.

401.9.10 - Compaction Equipment: Compaction may be performed by self-propelled steel-wheeled, pneumatic-tired and/or vibratory rollers. Hand-held rollers or vibrating plates may be used in small inaccessible areas if approved by the Engineer. Prior to use on any project, the roller shall be inspected to see that it is in good mechanical condition. The total weight, weight per inch of width (steel-wheeled), and average ground contact pressure (pneumatic-tired) shall be documented.

401.10 - PAVING OPERATIONS:

401.10.1 - Cleaning and Sweeping: Immediately prior to the arrival of the paving mixture, the existing base or surface shall be thoroughly cleaned by the use of tools and equipment as may be required to remove all mud, dirt, dust, and other caked or loose material foreign to the type of treatment or surface being placed. The cleaning shall be done to a minimum width of one foot on each side beyond the width of the surface being placed.

401.10.2 - Patching and Leveling and Scratch Courses:

401.10.2.1 - Patching and Leveling: A tack coat shall be applied to the existing pavement prior to placing patching and leveling.

Patching and leveling shall be placed at various locations throughout the project to remove irregularities in the existing pavement such as dips, or to raise the outside edge of the existing pavement to provide a uniform template prior to

placing a base or wearing course. Patching and leveling shall not be placed as a continuous layer or course over the full width and length of the project.

Compaction of patching and leveling shall be performed with three-wheel (steel) or pneumatic-tire rollers.

401.10.2.2 - Scratch Course: A tack coat shall be applied to the existing pavement prior to placing a scratch course.

The scratch course shall be placed to the limits designated on the plans. Scratch course shall be placed with a paving machine. The paving machine screed shall be set to drag on the high areas of the existing pavement, only depositing material in ruts and other depressions.

The wearing course, or at least one lift of base course, should be placed over the scratch course prior to maintaining traffic in the lane where the scratch course has been placed. All repairs to a scratch course due to traffic damage shall be at the contractor's expense.

Compaction of a scratch course shall be performed with a three-wheel (steel) or pneumatic-tire roller.

401.10.3 - Spreading and Finishing: Before spreading any material, the contact surfaces of curbs, gutters, manholes, and of adjacent Portland cement concrete pavement edges shall be painted or sealed with asphalt material. Exact edge of pavement, except on concrete, shall be established by a string or chalk line for a distance of not less than 500 feet ahead of the spreading operation.

For mixes produced with neat (non-modified) asphalts (which may include PG 70-22, PG 64-22, PG 64-28, and PG 58-28) the temperature of the mixture at the time of placement shall be within the temperature requirements of the JMF. The JMF temperature range shall be within the master temperature range of 250° and 338° F (121° and 170° C) unless otherwise specified by the asphalt supplier. The mix temperature shall be monitored by inserting a dial type thermometer into the mix through the hole in the truck bed.

The temperature of the completed mix, when measured at the plant, shall be within the tolerance as established by the JMF. The first load which demonstrates temperatures outside of that range shall be accepted, provided that the temperature is still within the master temperature range. No additional loads of material shall be run out until necessary steps are taken to reestablish the temperature of the mix within the plant tolerance. When measured at the project site, the temperature of the mix shall be within the tolerance established by the JMF. The first truck load of material which demonstrates temperatures outside of that range or any trucks in transit at that time shall be accepted provided temperatures are within the master temperature range. Any truckload of material which exceeds the master temperature range may be rejected by the Engineer. However, the plant shall immediately be notified that no additional loads of material are to be dispatched until necessary action is taken to reestablish temperature within JMF specification limits.

When the surface temperature falls to within 10° F (6° C) of the weather restrictions of Table 401.8, the mix temperature may be increased up to a

maximum of 338° F (170° C) unless otherwise specified by the asphalt supplier. The temperature of each truckload of material shall be monitored for compliance. Any truckload of material which exceeds this maximum temperature may be rejected by the Engineer.

Mixes produced with asphalts that contain modifiers for high or low temperature performance enhancement shall meet the temperature requirements recommended by the asphalt supplier, which will be referenced on the JMF.

401.10.4 - Rolling Procedure: Shoulders, ramps, and similar areas shall be compacted in the same method as the mainline.

During rolling, roller wheels shall be kept moist with only enough water to avoid picking up material. Fuel oil on roller wheels or pneumatic tires is not allowed. Rollers shall move at a slow but uniform speed with the drive roll or wheels nearest the paver.

If rolling causes material displacement, the affected area shall be loosened at once with lutes or rakes and restored to its original grade with loose material before being re-rolled. Heavy equipment, including rollers, should not be permitted to stand on the finished surface before it has thoroughly cooled or set.

Mat temperature shall be measured using a non-contact infrared thermometer. The required density shall be obtained prior to the mat temperature reaching 175° F (80° C). The Contractor shall be allowed to lower this temperature to 165° F (74° C) if they can demonstrate during the first day of placement of each lift on each project that additional densification can be achieved without causing any pavement distress.

401.10.5 - Joints: The longitudinal joint in any layer shall offset that in the layer immediately below by approximately six inches; however, the joint in the top layer shall be at the centerline of the pavement if the roadway comprises two lanes of the width, or at lane lines if the roadway is more than two lanes in width. The transverse joint in any layer shall offset that in the layer immediately below by approximately six feet.

Joints between the existing and new HMA pavement shall be "heeled in" to the existing surface at the beginning and at the end of the project and at all other locations where the new pavement terminates against an existing HMA pavement.

These joints, as well as the transverse joints between one day's production and the next shall be carefully constructed and shall be formed by cutting back into the existing section to expose the full depth of the course. All joints shall be squared up to the full vertical depth of the course to be placed, and a tack coat of asphalt material shall be applied if called for by the Engineer. Joints adjacent to curbs, gutters, or adjoining pavement shall be formed by transporting back sufficient hot material to fill any space left uncovered by the paver. The joint shall be set up with lutes to a sufficient height to receive the full compactive effort from the rollers. After rolling, joints shall be at the same elevation as the adjacent lanes or sections and shall be free from ridges or depressions.

Transverse joints shall be checked for smoothness with a ten foot straight edge provided by the Contractor. All surface irregularities shall be corrected prior to proceeding with paving operations.

401.11 - PROTECTION OF PAVEMENT AND TRAFFIC CONTROL:

DELETE THE ENTIRE SUBSECTION AND REPLACE WITH THE FOLLOWING:

401.11 - PROTECTION OF PAVEMENT AND TRAFFIC CONTROL: The Contractor shall be responsible for the protection of HMA surfaces from damage by their equipment and personnel. When the construction of HMA surfaces is undertaken on projects under public traffic and the road surface is 16 feet wide or greater and the ADT is 400 or greater, the Contractor shall place no passing signs, Interim pavement markings, and Temporary pavement markings to delineate the edge line, centerline, and/or lane line of the roadway as required herein and in the project plans.

Interim markings are described as markings applied to freshly resurfaced roadways between lifts and after placement of the final lift prior to opening the portion of the roadway being resurfaced to traffic. These markings are intended to provide the minimum amount of delineation required for safe navigation of the roadway, and are to be succeeded by. Temporary markings within a three (3) to fourteen (14) day period, based on the type of roadway and AADT, as specified herein.

Temporary markings are described as markings, typically short-lived in nature, which supplant Interim markings and are to be succeeded by Permanent markings within a sixty (60) day time period.

Permanent markings are described as the final pavement marking application within a project. These markings generally supplant Temporary markings. There shall be a minimum calendar day time period, as defined in Section 663, provided between the placement of Temporary and Permanent pavement markings, depending on the seasonal time of placement .

The Contractor shall be responsible for maintaining both signs and Temporary pavement markings until such time as the Permanent markings are placed, or thirty calendar days after completion of the final course, whichever is less. No separate payment will be made for maintenance of these items but shall be included in the applicable pay items for initial installation.

Interim pavement markings shall be Type VIIA Interim Pavement Markings applied as described in Section 663.5.6 and shall meet the requirements of Material Section 715.40.3. Temporary pavement markings shall be as described in Section 636.8 and shall meet the requirements of the applicable Materials Section. Permanent markings shall be as described in Section 663.5.2 and shall meet the requirements of the applicable Materials Section. All Interim, Temporary, and Permanent Pavement Markings shall be in conformance with the Manual on Uniform Traffic Control Devices (MUTCD).

All Interim pavement markings shall be installed by the end of the work day by placing the markings as the paving operation progresses within 1000 feet (300 meters) of the paver. Removal of Interim pavement markings shall not be required between lifts or after placement of the final markings. Payment of Interim pavement markings shall be incidental to the 401 Items.

401.11.1 - Interim Traffic Control for Two-Lane, Two-Way Roadways: Prior to any work which will cover the centerline, the Contractor shall install 24-inch x 30-inch "DO NOT PASS" (R4-1) signs on permanent posts at the beginning of each no passing zone throughout the length of the project. These signs shall be placed at the beginning of each no passing zone and shall be repeated every 2,500 feet as required. Payment shall be made under the "Traffic Control Devices" item.

To delineate the centerline of the roadway, the Contractor shall install yellow Interim Pavement Markings measuring 4 inches x 4 inches along the centerline of the roadway on 20 foot centers.

401.11.1.1 – Temporary Pavement Markings for two-way, two-lane roadways

401.11.1.1.1 – AADT equal to or > 3,000: The Interim Pavement Markings described in 401.11.1 shall be permitted only for a period of up to three (3) calendar days after completion of the final course. Within this time, the Contractor shall install a full compliance Temporary centerline and full compliance Temporary edgelines in conformance with Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.11.1.1.2 – AADT < 3,000: The Interim Pavement Markings described in 401.11.1 shall be permitted only for a period of up to fourteen (14) calendar days after completion of the final course. Within this time, the Contractor shall install a full compliance Temporary centerline and full compliance Temporary edgelines in conformance with Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.11.2 - Interim Traffic Control for One-Way Multilane Roadways: On all one-way multilane roadways, the Contractor shall install white Interim Pavement Markings measuring 4 inches x 48 inches along the lane line. Interim Pavement Markings shall be placed on 40-foot centers.

401.11.2.1 - Temporary Pavement Markings: After paving is first completed in the left lane, and prior to the left lane being opened to traffic, the Contractor shall install a full compliance Temporary yellow edge line. Prior to the remaining lanes being opened to traffic, the Contractor shall install a full compliance Temporary white lane lines and white edge line. These markings shall

be in conformance with Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.11.3 - Interim Traffic Control for Two-Way Three-Lane Roadways: Prior to any work which will cover the centerline and/or lane lines, the Contractor shall install 24-inch x 30-inch "DO NOT PASS" (R4-1) signs on permanent posts at the beginning of each no-passing zone throughout the length of the project as required. "DO NOT PASS" signs in both directions will be required for Center Left Turn Lanes.

These signs shall be placed at the beginning of each no-passing zone and shall be repeated every 2500 feet as required. Payment shall be made under the "Traffic Control Devices" item.

The Contractor shall install Interim Pavement Markings measuring 4 inches x 48 inches. Where truck-climbing lanes exist, the centerline shall be marked with two parallel yellow lines separated by a four-inch space placed on 40-foot centers. Lane lines shall be marked with white lines placed on 40-foot centers. Where center left-turn lanes exist, the center lane shall be marked with two parallel yellow lines separated by a four-inch space, and placed on 40-foot centers on both sides of the center lane.

401.11.3.1 - Temporary Pavement Markings: The Interim Pavement Markings described in Section 401.11.3 shall be permitted only for a period of up to three calendar days after completion of the final course. Within this time, the Contractor shall install full compliance centerline, lane line, and edgeline Temporary pavement markings in conformance with Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.11.4 - Interim Traffic Control for Two-Way Four-Lane and Five-Lane Roadways: On all two-way four-lane and five-lane highways, the Contractor shall install Interim Pavement Markings measuring 4 inch x 48 inch along the lane line and centerline where required. Centerlines shall be marked with two parallel yellow lines separated by a four inch space placed on 40 foot centers. On five-lane roadways these markings shall be placed on both sides of the center left turn lane. Lane lines shall be marked with white lines placed at 40 foot centers.

401.11.4.1 - Temporary Pavement Markings: The Interim Pavement Markings described in Section 401.11.4 shall be permitted only for a period of up to three calendar days after completion of the final course. Within this time the Contractor shall install full compliance Temporary lane line, centerline, and edge line pavement markings in conformance with
Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.11.5 - Seasonal Temporary Markings: If it becomes necessary to open the roadway to traffic prior to the completion of paving operations for longer than 14 calendar days, whether on the base or final course, the Contractor shall install full compliance Temporary pavement markings in conformance with Section 636. Payment for Temporary pavement markings shall be made under the "Temporary Pavement Marking Paint" pay item.

401.12 - METHOD OF MEASUREMENT:

HMA will be measured by the ton (Mg). The quantity will be determined by the Contractor from the total weigh slips for each vehicle load weighed upon an approved standard scale or from digital printout slips from an automatic batching plant, and certified by the Contractor as correct.

Any patching or leveling mixture placed on a subbase or base course constructed in the same Contract with the HMA items shall be at the expense of the Contractor. No additional compensation will be allowed for the material or any work incidental to its placement.

401.13 - BASIS OF PAYMENT:

The quantities determine as provided above, will be paid for at the contract unit price for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all the work herein prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, field laboratory, supplies, and incidentals necessary to complete the work.

The conditioning, cleaning, and sweeping of the existing base or underlying surface shall be considered as part of the construction of the appropriate items listed in 401.14, and no additional compensation will be allowed for "Cleaning and Sweeping".

There will be no additional compensation for tack coat material used for minor (spot) areas to be patched and leveled; the cost of this tack coat material will be included in the unit bid price for the "patching and leveling" Item.

There will be no additional compensation for Interim Pavement Markings.

401.13.1 - When a LOT of Superpave HMA material is found not in compliance with the tolerance requirements of MP 401.02.29, it shall be subject to a price adjustment in accordance with the criteria established in this MP.

401.13.2 – When a LOT of HMA pavement is represented by a smoothness value larger than that shown in Tables 401.7.2E or 401.7.2M, the unit price of the LOT (surface course only) shall be determined as follows:

<u>ENGLISH VERSION</u>:

Reduced Unit Price	=	Unit Bid Price X [(127.86 – As)/100]
Where A	=	0.429 when specified smoothness is 65 in/mi
Where A	=	0.341 when specified smoothness is 81 in/mi
Where s	=	Smoothness value measured as per 401.7.2

METRIC VERSION:

Reduced Unit Price	=	Unit Bid Price X [(127 – As)/100]
Where A	=	0.0274 when specified smoothness is 1 000mm/km
Where A	=	0.0218 when specified smoothness is 1 250 mm/km
Where s	=	smoothness value measured as per 401.7.2

When the measured smoothness value exceeds the specified value by 50% or more, the LOT so measured shall be corrected, at the Contractor's expense, to comply with Tables 401.7.2E or Table 401.7.2M.

401.13.3 - When a LOT of HMA pavement does not meet the density requirements of 401.7.3, the price shall be adjusted as follows:

TABLE 401.13.3

ADJUSTMENT OF CONTRACT PRICE FOR PAVEMENT DENSITY NOT WITHIN TOLERANCE OF DENSITY	
Percent of Density	**Percent of Contract Price to be Paid**
Greater than 96 %	*
92 % to 96 %	100
91 %	98
90 %	96
89 %	92
88 %	88
Less Than 88 %	*
* The Division will make a special evaluation of the material and determine the appropriate action.	

401.13.4 - When a LOT of HMA pavement is determined to be statistically non-conforming in accordance with criteria 'B' of Section 401.7.4, the Division will review the plans and project records to determine if there is an acceptable explanation for this deficiency. If it is determined that a deficiency does exist, one of the following adjustments may be used. If the deficiency is less than ¾ inch (19 mm), the Division may choose to accept the material at a price equal to the bid price times the ratio of the average thickness divided by the specified thickness. If the deficiency is ¾ inch (19 mm) or greater, the Division may require that an additional lift of material [specified to the nearest ¼ inch (6 mm) of the deficiency] be placed at the Contractor's expense. Retesting of the overlay will be at the expense of the Contractor in accordance with MP 109.00.20.

401.14 - PAY ITEMS:

DELETE THE LAST ITEM FROM THE PAY ITEM TABLE AND SUBSTITUTE THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
401001-*	"design method" HOT-MIX ASPHALT BASE COURSE, "aggregate type", TYPE "mix type"	TON (MG)
401002-*	"design method" HOT-MIX ASPHALT WEARING COURSE, "aggregate type", TYPE "mix type"	TON (MG)
401003-*	"design method" HOT-MIX ASPHALT PATCHING AND LEVELING COURSE, "aggregate type	TON (MG)
401007-*	"design method" SCRATCH COURSE, "aggregate type" , TYPE 'mixed type"	TON (MG)

- "design method" shall be either Marshall or Superpave
- "aggregate type" shall be either stone and gravel or slag
- "mix type" from Table 401.4.2A or 401.4.2B
- Sequence number

SECTION 402
HOT-MIX ASPHALT SKID RESISTANT PAVEMENT

402.1 - DESCRIPTION:

This work shall consist of constructing a Hot-Mix Asphalt (HMA) Skid Resistant Wearing Coarse or a Superpave HMA Skid Resistant Wearing Coarse in accordance with the requirements of the Section 401 Asphalt Specification with the following exceptions and additions:

402.2 - MATERIALS:

The coarse aggregate shall consist of gravel, slag, or other acceptable polish resistant aggregate, or combinations thereof, meeting the requirement of Subsections 703.1 through 703.3, except as amended in this subsection.

When stone or gravel is specified in the contract, the coarse aggregate shall consist of gravel or other acceptable polish resistant aggregate, or combination thereof meeting the requirements of 703.1 through 703.3, except as amended in this subsection. When slag is specified in the contract, the coarse aggregate shall be slag which meets the requirements of 703.3, except as amended in this subsection.

Acceptable dolomite may be used alone or as a part of a coarse aggregate blend on roadways with an ADT of 10,000 or less. On roadways exceeding 10,000 ADT, acceptable dolomite may be used only as a part of the coarse aggregate blend and shall not exceed 50% of that blend.

The total of shale (determined by MP 703.00.27), coal and other lightweight deleterious material (determined by ASTM C123) and friable particles (determined by MP 703.01.20) shall not exceed three percent.

402.2.1 - Marshall Mix Designs: For Marshall mix designs, the coarse aggregate or blends thereof shall have a minimum of 80 percent two-face fracture, and, except for those carbonate rocks which may be designated as acceptable polish resistant aggregate, the portion obtained on the No. 4 (4.75 mm) sieve shall contain no more than 15 percent carbonate particles.

The total thin and elongated pieces, when tested as per MP 703.00.25, shall not exceed five percent.

402.2.2 - Superpave Mix Designs: For Superpave mix designs, the coarse aggregate or blends thereof shall have a minimum angularity requirement as specified in MP 401.02.28, Table 401.02.28C and, except for those carbonate rocks which may be designated as acceptable polish resistant aggregate, the portion obtained on the No. 4 (4.75 mm) sieve shall contain no more than 15 percent carbonate particles.

Flat and elongated particles shall be tested in accordance with ASTM D4791 and the procedure modification referenced in AASHTO MP2. The total flat and elongated particles, measured at a 5:1 ratio, shall not exceed ten percent by weight for all pavements where the estimated traffic level is greater than or equal to 0.3 million ESALs.

402.3 - FINE AGGREGATE:

402.3.1 - Marshall Mix Designs: Fine aggregate shall meet the requirements of 702.3.

402.3.2 - Superpave Mix Designs: Fine aggregate shall meet the requirements of 702.3 along with the addition of the fine aggregate angularity and sand equivalent requirements noted in MP 401.02.28, Table 401.02.28C.

402.4 - MIXING:

The skid resistant paving mix shall be type designated on the plans.

402.5 - PAY ITEMS:

Method of measurement and basis of payment will be in accordance with the applicable sections of Section 401.

ITEM	DESCRIPTION	UNIT
402001-*	"design method" HOT-MIX ASPHALT SKID RESISTANT PAVEMENT, "aggregate type", TYPE "mix type"	TON (MG)

- "design method" shall be either Marshall or Superpave
- "aggregate type" shall be either stone and gravel or slag
- "mix type" from Table 401.4.2A or 401.4.2B
- Sequence number

SECTION 405
SURFACE TREATMENTS

405.2 - MATERIALS:

DELETE AND REPLACE WITH THE FOLLOWING:

405.2 - MATERIALS:

The materials shall conform to the requirements of the following Subsections of Division 700:

MATERIALS	SUBSECTION	KIND OR GRADATION
[1]Coarse Aggregate	703.1-4	56, 6, 7,78, 8 or 9
Liquid Asphalt Asphalt Emulsion	705.4	MS, RS, SS, HFMS, or HFRS Grades
Liquid Asphalt (Medium-Curing Type)	705.3	MC-250 or MC-800
[2]Cationic Emulsified Asphalt	705.11	CMS, CRS, or CSS Grades

[1]In addition to meeting the gradation requirements specified in Table 703.4 the aggregates shall have a maximum of 2.0% passing the #200 (75μm) sieve as determined by AASHTO T-11 and T-27.

[2]May be used with aggregate other than gravel only if the aggregate asphalt combination meets the requirements of ASTM D1664 for the dry aggregate coating test.

405.2.1 - Quality Control Testing: Quality control is the responsibility of the Contractor as specified in 106.1.

The contractor shall design a quality control plan detailing the methods by which the quality program will be conducted. Samples will be obtained at a minimum frequency of one sample per day of aggregate placement.

405.2.2 - Acceptance Testing: Acceptance sampling and testing of aggregates is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for Acceptance.

405.2.3 - Acceptance for the Grading of Coarse Aggregate: Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. The

material shall be sampled and tested in accordance with the applicable specification. The gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test values fall outside the limits of Table 703.4 the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 405.2.3.2. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply.

405.2.3.1 - Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the nonconforming test value and the specification limit shall be determined for each sieve size determined to be nonconforming and this value shall be multiplied by its appropriate multiplication factor as set forth in Table 405.2.3.1 to determine the degree of nonconformance on that sieve.

TABLE 405.2.3.1

NONCONFORMIING MULTIPLICATION SIEVE SIZE	FACTOR
4 IN (100mm) to No 16(1.18mm)	1.0
No 40 (4.25µm) to No 50 (300µm)	1.5
No 100 (150µm)	2.0
No 200 (75µm)	2.5

The total measure of nonconformance of an individual sublot is the sum of all nonconformances on the various sieve sizes of that sublot. When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in Table 405.2.3.2. When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

405.2.3.2 - Price Adjustment: Aggregates not conforming with the gradation requirements will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 405.2.3.2.

TABLE 405.2.3.2

ADJUSTMENT OF CONTRACT PRICE FOR GRADATION NOT WITHIN SPECIFICATIONS	
Degree Of Nonconformance	**Percent Of Contract Price To Be Reduced**
1.1 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*

* The Division will make a special evaluation of the material and determine the appropriate action. Pending resolution of the matter, additional lifts of base or pavement shall not be placed over the nonconforming material.

405.3 - WEATHER AND SEASONAL LIMITATIONS:

DELETE THE HEADING AND CONTENTS AND REPLACE WITH THE FOLLOWING:

405.3 - WEATHER RESTRICTIONS:

Surface treatment shall be constructed only when the condition of the base, subbase or existing surface is satisfactory to the Engineer, when the temperature of the material being overlaid is 50° F (10° C) or above, and when other weather conditions are satisfactory for construction. The temperature may be waived but only when approved by the Engineer.

405.4 - EQUIPMENT:

DELETE AND REPLACE WITH THE FOLLOWING:

405.4 - EQUIPMENT:

Equipment shall include power broom and power blower, a broom drag, equipment for heating bituminous material, a self powered bituminous material pressure distributor, an aggregate spreader, and compaction equipment. Equipment shall also include scrapers, hand brooms, shovels, and other items as may be necessary to thoroughly clean the base or surface.

Equipment for heating bituminous material shall consist of a retort or steam coils so designed that steam will not be introduced into the material.

The distributor shall be so designed, equipped, maintained and operated that bituminous material at even heat may be applied uniformly on variable widths of surface up to 15 ft. (4.6 m) at readily determined and controlled rates from 0.05 to

2.0 gal. Per sq. yd (0.22 to 9.3 liters m^2) uniform pressure and with an allowable variation from any specified rate not to exceed 0.02 gal. per sq. yd (0.09 liter m^2).

Distributor equipment shall include a tachometer, pressure gages, and accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically. A manifold connection shall be provided and hand spraying equipment shall be available to cover areas and patches inaccessible to the distributor.

The spreader for cover grades of coarse aggregates shall be self-propelled. It shall be a mechanical revolving cylinder type or mechanical roller hopper spreader that can be so adjusted to spread accurately the required amounts of materials per square yard. The spreader for other grades of coarse aggregate shall be a self-propelled mechanical stone spreader capable of laying a uniform surface. Other types of aggregate spreaders may be used provided they accomplish results equal to those obtained by the types described.

Compaction equipment shall be a pneumatic-tired roller conforming to the requirements of Section 401.9.10.

405.6 - CLEANING AND SWEEPING:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

405.6 - CLEANING AND SWEEPING:

Immediately before starting construction, the existing surface shall be swept and thoroughly cleaned by the use of tools or machinery as may be required to remove all mud, dirt, dust, and other caked or loose material foreign to the type of surface to be placed. Cleaning shall be done to a minimum width of one foot on each side beyond the width of the surface to be placed excluding the shoulder.

When the new surface is to be placed on an untreated aggregate surface, the sweeping shall continue until embedded larger aggregate is exposed to a depth of approximately 1/4 in (6 mm). When the new surface is being compacted and finished, the Contractor shall trim its edges neatly to line. Materials collected in the cleaning operation shall be removed and disposed of as directed.

405.11 - PROTECTION OF PAVEMENT AND TRAFFIC CONTROL:

DELETE THE CONTENT AND REPLACE WITH THE FOLLOWING:

The Contractor shall be responsible for the protection of the surface against damage by their equipment and personnel. Traffic shall not be permitted on any part of the work under construction until the treatment has cured sufficiently to prevent raveling or pickup under traffic. The applicable provisions of 636 shall apply for regulating traffic.

405.13 - METHOD OF MEASUREMENT:

DELETE THE FIRST SENTENCE IN PARAGRAPH TWELVE:

405.15 - PAY ITEMS:

ADD TO THE END OF TABLE 405.15:

ITEM	DESCRIPTION	UNIT
4050004-*	CLEANING AND SWEEPING	SQUARE YARDS (Square Meters)

SECTION 408
TACK COAT

408.2 - MATERIALS:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

408.2 - MATERIALS:

The materials shall conform to the requirements of the following Subsections of Division 700:

MATERIALS	SUBSECTION	KIND OR GRADATION
[1]Coarse Aggregate	703.1-4	7, 8, 9 or 10
[2]Fine Aggregate	702.6	
Liquid Asphalt Asphalt Emulsion	705.4	RS, MS, SS, HFMS, HFRS Grades, or AEM1
Liquid Asphalt (Medium-Curing Type)	705.3	MC-250 or MC-800
[3]Cationic Emulsified Asphalt	705.11	CMS, CRS, or CSS Grades

[1]In addition to meeting the gradation requirements specified in Table 703.4 the aggregates shall have a maximum of 2.0% passing the #200 (75µm) sieve as determined by AASHTO T-11 and T-27.
[2]In addition to meeting the gradation requirements specified in 702.6 the aggregates shall have a maximum of 2.0% passing the #200 (75µm) sieve as determined by AASHTO T-11 and T-27
[3]May be used with aggregate other than gravel only if the aggregate asphalt combination meets the requirements of ASTM D1664 for the dry aggregate coating test.

ADD THE FOLLOWING SECTION:

408.2.1 - Quality Control Testing: Quality control is the responsibility of the Contractor as specified in 106.1.

When tack coat aggregate is used the contractor shall design a quality control plan in accordance with applicable section of MP307.00.50, excluding the attached page, detailing the methods by which the quality control program will be conducted. Samples will be obtained at a minimum frequency of one sample per day of aggregate placement.

408.2.1.1 - Acceptance Testing: Acceptance sampling and testing of aggregates is the responsibility of the Division, except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for Acceptance.

408.2.2 - Acceptance Procedure: Acceptance for gradation shall be in accordance with 405.2.3.

408.3-WEATHER RESTRICTIONS:

DELETE THE LAST SENTENCE OF THE FIRST PARAGRAPH

408.4 - EQUIPMENT:

DELETE THE LAST SENTENCE OF THE PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Equipment shall conform to the applicable requirements prescribed in 405.4.

408.6 - CLEANING AND SWEEPING:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

When called for, this work shall be done as specified in 405.6.

408.7 - APPLICATIONS OF BITUMINOUS MATERIAL:

DELETE THE FIFTH SENTENCE OF PARAGRAPH THREE AND SUBSTITUTE THE FOLLOWING:

The intent of the two preceding sentences, in conjunction with the next to the last paragraph of 401.13, is (1) to provide one tack coat application on the existing surface, although two application, one over one under, for minor (spot) patching and leveling area, are permitted as indicated above, and (2) to limit payment for such operations to one application of the tack coat upon the existing surface for the entire project.

DIVISION 500
RIGID PAVEMENT

SECTION 501
PORTLAND CEMENT CONCRETE PAVEMENT

501.4.1 - Test Methods:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

Slump of Portland Cement Concrete	AASHTO T 119
Air Content of Freshly Mixed Concrete	AASHTO T 152 AASHTO T 196
Unit Weight/Yield of Concrete	AASHTO T 121
Making and Curing Concrete Test Specimens	AASHTO T 23 with MP 601.04.20
Compressive Strength of Cylindrical Concrete Specimens	AASHTO T 22
Flexural Strength of Concrete	AASHTO T 97
Obtaining and Testing Drilled Core Specimens	AASHTO T 24
Measuring Length of Drilled Concrete Cores	AASHTO T 148
Total Moisture Content of Aggregate by Drying	AASHTO T 255
Sampling Fresh Concrete	AASHTO T 141
Sieve Analysis of Fine and Coarse Aggregates	AASHTO T 27 and T 11
Determination of Free Moisture in Fine Aggregate Using 20 Gram or 26 Gram "Speedy Moisture Tester"	MP 702.00.20
Sampling Aggregates	MP 700.00.06
Determination of Total Solids in Concrete	MP 601.03.51

501.7 - HANDLING, MEASURING, AND BATCHING MATERIALS:

ADD THE FOLLOWING AS THE NEXT TO THE LAST PARAGRAPH:

When cement or pozzolanic additives are being added in bag form, under no circumstances shall the packaging material be allowed to enter into the mix.

SECTION 506
CONCRETE PAVEMENT REPAIR

DELETE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

506.1 - DESCRIPTION:

This work shall consist of the removal and replacement of deteriorated concrete pavement and patches at locations as shown on plans or as specified by the Engineer.

506.2 - MATERIALS:

Materials shall meet the requirements of Division 501 or 601, and as follows:

Joint sealer	**708.3**

An accelerating admixture meeting the requirements of AASHTO M 194 may be used.

An approved epoxy grout shall be used to firmly anchor dowel bars in 30 minutes. Bond breaker material shall be supplied from approved sources.

506.3 - PROPORTIONING:

The concrete produced shall meet the requirements of 501, except that the design compressive strength for Special Concrete Pavement Repair shall be 2000 psi (13.8 Mpa) prior to opening traffic. When concrete is to be overlayed with asphalt the requirements of 601 may be substituted. The Contractor shall submit the mix proportions and recent test data for compressive strength at specified age for the concrete to be used.

506.4 - TESTING:

When the strength of concrete specimens representing the concrete placed indicate that the concrete has attained the design strength, that concrete represented by the specimens may be put into service.

506.5 - CONDITIONING EXISTING SUBBASE:

Prior to placing the concrete for the rigid replacement, any subbase material that is disturbed below the desired level of cleanout shall be removed and the patch area compacted to the satisfaction of the Engineer. The Contractor shall replace the removed subbase material with concrete integral to pavement replacement up to a maximum 1-inch (25 mm) depth. In event soft areas are encountered in the subbase or subgrade, the Engineer may require replacement of subbase and subgrade with 307001-* subbase material and installation of underdrains. The cost of replacing the subbase and subgrade shall be paid for as item 506003-*. The cost of installation and method of installation of underdrains shall be as per Section 606.

506.6 - PLACING CONCRETE:

The concrete shall be placed in the patch using a metal chute; the free fall shall not be more than 3 ft. (1 m.). If the concrete does not fall into its final position in the patch, it shall be moved by means of shovels; raking is prohibited. The concrete shall be worked with tampers, spades or other tools to completely fill the patch area. Maximum effort will be used to ensure that the area beneath the existing concrete pavement is completely filled, internal vibration will be used.

Following the placing of the concrete, the surface will be struck off to finished grade by means of an adjustable steel or wooden template and floated to a smooth finish.

506.7 - CURING:

In accordance with Section 501.14 where early opening to traffic is required, insulation mats may be used over the repairs during curing will be used to accelerate strength gain.

506.8 - RIDE ACCEPTANCE:

During finishing operations deviations in adjacent lanes which are also to be repaired shall not be transferred to the new construction. The Contractor shall furnish and use straightedges to check the surface tolerance. For patches 10 ft. (3 m) or more in length, a 10 ft. (3 m) straightedge shall be used. Shorter straightedges shall be used for patches less than 10 ft. (3 m) in length.

The minimum length straight edge shall be 6 ft. (1.8 m). Section 501.12.6 shall govern except the shorter straightedges shall be used for shorter patches. The concrete pavement should be finished to match existing texture.

Surface tests on patches shall be performed as follows:

As soon as the concrete has hardened sufficiently, the pavement surface shall be tested with a 10 ft. (3 m) straightedge. The straightedge shall be placed in successive positions parallel to the road centerline matching existing wheel paths. Areas showing high spots of more than ¼ inch (6 mm), but not exceeding ½ inch (14 mm) in 10 ft. (3 m) shall be marked and ground down with an approved grinding tool to an elevation where the surface deviations will not be more than ¼ inch (6 mm) in 10 ft. (3 m). Where the deviations exceeds ½ inch (14 mm), either high or low, the areas shall be removed and replaced at the discretion of the Engineer and at the Contractor's expense. All areas or sections so removed shall not be less than 6 ft. (1.8 m) in length nor less than full width of the traffic lane involved. Any remaining portion of the slab adjacent to the joints that is less than 6 ft. (1.8 m) in length shall also be removed and replaced. Where concrete repairs are made that are to be overlayed the smoothness criteria is waived for the concrete repair.

506.9 - METHOD OF MEASUREMENT:

The quantity of concrete pavement repair to be paid for will be the number of square yards (meters) complete in place and accepted.

506.10 - BASIS OF PAYMENT:

The quantity of special concrete pavement repair, determined as provided above, will be paid for at the contract unit price which shall constitute full compensation for the furnishing, hauling and placing of all materials, including admixtures, the removal and disposal of old concrete, all labor, tools, equipment, and incidentals necessary to complete the item.

506.11 - PAY ITEM:

ITEM	DESCRIPTION	UNIT
506001-*	Concrete Pavement Repair	Square Yard (Meter)
506003-*	Remove And Replace Existing Aggregate Base Course	Cubic Yard (Meter)

* Sequence Number

DIVISION 600
INCIDENTAL CONSTRUCTION

SECTION 601
STRUCTURAL CONCRETE

601.1 - DESCRIPTION:

ADD AS THE SECOND SENTENCE OF PARAGRAPH 9:

If the contractor uses a higher class concrete, and the strength specimens do not meet the minimum strength requirement of that higher class concrete, no penalty will be applied, provided that the strength specimens exceed the minimum strength requirement of the concrete that was originally designated for the work.

ADD THE FOLLOWING PARAGRAPH TO THIS SUBSECTION:

Class H concrete shall be used for bridge decks and other bridge elements when designated in the plans.

DELETE THE NEXT-TO-LAST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

A water-reducing admixture may be used at the Contractor's option.

A non-chloride water-reducing accelerating admixture may be used at the Contractor's option.

A non-chloride accelerating admixture may be used at the Contractor's option.

ADD THE FOLLOWING BEFORE THE LAST PARAGRAPH:

A hydration control admixture may be used at the Contractor's option provided that the conditions in section 601.7 are met.

ADD THE FOLLOWING:

All classes of concrete shall be designated as *modified* when using increased design strengths.

A hydration control admixture may be used at the Contractor's option provided that the conditions in section 601.7 are met.

All classes of concrete shall be designated as *architectural* when using additional formwork as shown in Section 601.8.10.

601.2 - MATERIALS:

ADD THE FOLLOWING:

Class H Concrete Requirements: The total concrete constituents shall contribute less than 0.10% water soluble chloride ion by weight of cement. The Contractor shall use only one brand and/or source for any concrete constituent. The Contractor shall obtain a written statement from the manufacturer of the microsilica admixture that confirms the compatibility of the material combination and the sequence in which they are combined. The written statement, along with the results of all required tests, shall be furnished to the Engineer prior to the pre-pour meeting.

ADD THE FOLLOWING TO THE TABLE:

MATERIAL	SECTION OR SUBSECTION
Accelerating Admixtures	707.13
Water-Reducing, Accelerating Admixtures	707.14
Hydration Control Admixtures	707.15

601.3 - PROPORTIONING:

ADD THE FOLLOWING TO THIS SUBSECTION:

Class H concrete shall consist of a homogeneous mixture of cement, fine aggregate, coarse aggregate, microsilica admixture, fly ash or ground granulated blast furnace slag, chemical admixtures, and water.

Establishment of mixture proportions shall be coordinated with the manufacturer of the microsilica admixture.

Design mixture testing for Class H concrete shall be in accordance with MP 711.03.23 and shall include air content, slump, compressive strength, and rapid chloride permeability tests. For establishment of mixture proportions, rapid chloride

permeability tests shall be made on representative samples prepared and tested in accordance with AASHTO T277. The rapid chloride permeability test specimens shall be tested at an age of 90 days (or at any time prior to 90 days), and the results of this test shall not exceed 750 coulombs. Specimens shall be moist cured for 56 days prior to the start of specimen preparation unless specimens are to be tested prior to 56 days, in which case the specimens shall be moist cured until the time of test. The 28-day compressive strength of the test mix that satisfies the 750 coulomb threshold shall be used as the basis for acceptance of Class H concrete per Section 601.4.5. The cost of all test mix requirements shall be considered incidental to the cost of Class H concrete.

ADD THE FOLLOWING:

The proportions for any concrete designated as *modified* shall be submitted by the Contractor to the Engineer for approval. The Design 28-Day Compressive Strength shall be as shown in the plans. The contractor's mix design shall utilize Table 601.3.1, except the Target Cement Factor may be revised to obtain the modified strength.

601.3.1:

ADD THE FOLLOWING AT THE END OF THE FIRST PARAGRAPH:

Each mix design shall remain approved for a period of three years from the date of approval, after which the mix design may be re-approved for an additional time period. The guidelines for this re-approval process are set forth in MP 711.03.23.

DELETE TABLE 601.3.1A AND TABLE 601.3.1B AND REPLACE WITH THE FOLLOWING TABLES:

TABLE 601.3.1A {ENGLISH}					
Class of concrete	**Design 28 Day Compressive Strength**	**Target Cement Factor**	**Maximum Water Content**	**Standard Size of Coarse Aggregate**	**Entrained Air**
	Pounds per Square inch	lbs./c.y. *	lb. of water / lb. of cement **	Number	Percent
A	3500	682	0.51	7, 78, or 8	7½
K	4000	658	0.44	57, 67	7
B	3000	564	0.49	57, 67	7
C	2500	494	0.58	57, 67	6
D	2000	400	0.62	57, 67	5½
H	4000	658	0.40	57,67	6½

TABLE 601.3.1A {METRIC}					
Class of concrete	**Design 28 Day Compressive Strength**	**Target Cement Factor**	**Maximum Water Content**	**Standard Size of Coarse Aggregate**	**Entrained Air**
	Mpa	Kg per cu. M. *	L/Kg of cement **	Number	Percent
A	24	404	0.51	7, 78, or 8	7½
K	28	390	0.44	57, 67	7
B	21	335	0.49	57, 67	7
C	17	295	0.58	57, 67	6
D	14	235	0.62	57, 67	5½
H	28	390	0.40	57,67	6½

* An equal volume of a pozzolanic additive may be substituted for Portland cement up to the maximum amount in Table 601.3.1B. Only one pozzolanic additive is permitted in a mix design, except for Class H concrete. The target cement factor of Class H concrete shall consist of Option 1 or Option 2 from Table 601.3.1C. The Contractor may choose either option.

TABLE 601.3.1B		
MATERIAL	**CLASS OF CONCRETE**	**QUANTITY**
Fly Ash	B, C, D	0.48 ft^3 (0.014 m^3)
	A, K	0.60 ft^3 (0.017 m^3)
Ground Granulated Furnace Slag	A, B, K	1.43 ft^3 (0.040 m^3)
	C, D	0.96 ft^3 (0.027 m^3)
Microsilica	All Classes	0.24 ft^3 (0.007 m^3)

** When using a pozzolanic additive, volumes of these materials shall be considered as cement for purposes of establishing maximum water content.

TABLE 601.3.1C				
OPTION	**CEMENT**	**FLY ASH**	**GROUND GRANULATED FURNACE SLAG**	**MICROSILICA**
1	2.39 ft^3	0.84 ft^3		30 lbs.
2	2.15 ft^3		1.08 ft^3	30 lbs.

MP 711.03.26 shall be used to control the cement factor in all classes of concrete except Class H.

TABLE 601.3.2 CONSISTENCY:

DELETE SECTION iii, AND SUBSTITUTE THE FOLLOWING:

TYPE	*OPTIMUM CONSISTENCY Inches of Slump (mm of slump)
iii. a. For reinforced concrete structures which are not easily accessible for spading and vibrating and offer a fair degree of difficulty in the placement and consolidation of the concrete, such as pier caps and abutments, beams and girders, box culverts, miscellaneous structure footings and other slab type structures, wall or vertical sections 8 inches (200 mm) or greater in width with one line of reinforcement or 12 inches (300 mm) or greater in width with two lines of reinforcement.	3 inches (75 mm)
b. For bridge decks	2 ½ inches (62 mm)

601.3.2.1 - Consistency:

ADD THE FOLLOWING TO THE FIRST PARAGRAPH OF THIS SECTION:

Concrete for any "Slump Test" shall be deposited in a manner and location that excludes the effects of vibrations caused by traffic and concrete placement operations.

ADD THE FOLLOWING TO THE FOURTH PARAGRAPH OF THIS SECTION:

The slump of Class H concrete shall not exceed 7 inches (175 mm) under any circumstances.

ADD THE FOLLOWING AT THE END OF THE SECTION:

An approved Type F or Type G admixture may be used to increase the consistency and improve the workability of the concrete as long as the requirements of section 707.2.2.1 or section 707.3.2.1 are met. When an admixture is used for this purpose, it may be referred to as a superplasticizer.

No more than a total of two additions of a superplasticizer shall be permitted in any one batch of concrete. If a superplasticizer is used at the batch plant, then only one field addition is permitted. The total quantity of the superplasticizer shall not exceed the manufacturer's recommended dosage rate.

Upon addition of a superplasticizer at the job site, the mixing drum shall be turned for a minimum of 60 revolutions or 5 minutes at mixing speed to establish a workable mixture of uniform composition and consistency. If a second job site addition of superplasticizer is used; the mixing drum shall be turned a minimum of 30 additional revolutions at mixing speed. All additions and mixing of the superplasticizer shall be completed before placement of the concrete is started. The total number of revolutions shall not exceed 300, and the concrete shall be discharged within the time limits in section 601.7.

When a superplasticizer is used, the optimum consistency target value may be increased by 4 inches (100 mm), but under no circumstances shall the slump exceed 8 inches (200 mm).

Acceptance tests for consistency (slump), air content, compressive strength, etc. shall be made after all additions and mixing of the superplasticizer. Slump tests shall be performed on every batch of concrete to which superplasticizer is added (one test before and one test after the addition of superplasticizer).

The Contractor shall obtain a written statement from the manufacturer of the superplasticizer stating:

i. The manufacturer is satisfied with the compatibility of the combination of materials and the sequence in which they are combined.
ii. The recommended maximum admixture dosage rate.

iii. The names of the designated technical representatives from the ready-mix supplier or the admixture company who are competent to determine the proper dosage of superplasticizer for the intended applications.

This written statement from the admixture manufacturer shall be made available to project personnel before any superplasticizer is added at the job site.

601.3.2.2 – Air Content:

ADD THE FOLLOWING TO THE FIRST PARAGRAPH:

The target of the entrained air content of Class H concrete at the time of placement shall be as shown in Table 601.3.1A. If the entrained air does not conform with the target value within plus or minus 1.5 percentage points, the Contractor shall take immediate steps to adjust the air content of succeeding loads by making necessary adjustments in the mixture. If the entrained air content of Class H concrete does not conform to the target value plus 2.0 percentage points, the concrete shall be rejected. When Class H concrete is delivered in a truck mixer and the air content is less than the target value minus 2.0 percentage points, the concrete shall be rejected or the Contractor may use additional air-entraining agent in an amount that is intended to achieve the target value specified. The addition is permitted under the conditions listed below.

601.3.2.2:

DELETE SECTION iii AND INSERT THE FOLLOWING:

iii. Immediately after mixing, the air content and slump shall be measured by a certified Portland Cement Concrete Inspector.

601.3.2.4 – Total Solids Ā:

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Ā is the value obtained by grading of the total solids (coarse aggregate, fine aggregate, and cement). The Ā shall be determined by the Contractor (in accordance with MP 601.03.51) at least once for every 50 cubic yards (37.5 cubic meters) of concrete that are produced from the same mix design. However, not more than one Ā test (for each mix design) shall be required per calendar day as long as not more than 400 cubic yards (305 cubic meters) of concrete are produced in a single day from the same mix design. In situations when more than 400 cubic yards (305 cubic meters) of concrete are produced in a single day from the same mix design, two Ā tests shall be required (one in the AM and one in the PM) for that mix design.

During any calendar week (Sunday through Saturday) in which concrete is being produced, a minimum of one Ā test shall be required (for each mix design from which concrete is being produced). This Ā test shall be conducted on the first day of production of that calendar week. For days on which concrete is being produced, but no Ā test is required, laboratory number XXXXXXX shall be used for Ā test documentation purposes.

Should the moving average of any five consecutive grading tests of the total solids have an Ā outside the specified mix design tolerance limits, production shall be discontinued until appropriate corrections are made. Corrections shall be made either in the proportions of the concrete (the mix design), the gradation of the aggregates, or the storage and loading of the aggregate, as the Contractor may elect.

601.4.1 - Sampling and Testing Methods:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

Sampling fresh concrete	AASHTO T 141
Sampling aggregate	MP 700.00.06
Sieve analysis of fine and coarse aggregates	AASHTO T 27 and T 11
Slump of Portland cement concrete	AASHTO T 119 (Note 1)
Air content of freshly mixed concrete	AASHTO T 152 AASHTO T 196
Unit weight/Yield of concrete	AASHTO T 121
Making and curing concrete compressive specimens	AASHTO T 23 With MP 601.04.20
Compressive strength of cylindrical concrete specimens	AASHTO T 22
Total moisture content of aggregate by drying	AASHTO T 255
Predicting potential strength of Portland cement concrete	MP 711.03.31
Determination of Ā of total solids in concrete	MP 601.03.51
Determination of free moisture in fine aggregate using 20 gram or 26 gram A “Speedy Moisture Tester”	MP 702.00.20

Note 1 - When testing concrete produced by volumetric batching and continuous mixing, the consistency testing shall be delayed for approximately three to five minutes after mixing.

601.4.2 - Contractor's Quality Control:

INSERT THE FOLLOWING AFTER THE SECOND SENTENCE:

The Contractor's personnel who conducts the field sampling and testing shall be a certified Portland Cement Concrete Inspector.

601.4.4 - Compressive Strength Tests for Acceptance:

DELETE THE FIRST SENTENCE AND REPLACE WITH THE FOLLOWING:

A strength test shall consist of three test specimens. Either 6" x 12" (150 mm x 300 mm) cylinders or 4" x 8" (100 mm x 200 mm) cylinders are permitted, provided the requirements of MP 711.03.23 are met. The size of the cylinders which the Contractor intends to use on each project shall be listed in the Contractor's Quality Control Plan.

CHANGE SENTENCES SEVEN AND EIGHT OF THE SECOND PARAGRAPH, TO THE FOLLOWING:

If this statistical analysis indicates at least 93 percent of the material may be expected to have compressive strengths equal to or greater than that shown in Table 601.3.1 and 99.87 percent of the material may be expected to have compressive strengths at least one standard deviation above forty percent of the design strength ($0.4f'_c+\sigma$), the work will be accepted as substantially complying with the specification requirements. If this statistical analysis indicates that less than 93 percent of the material may be expected to have compressive strengths equal to or greater than that shown in Table 601.3.1 or less than 99.87 percent of the material may be expected to have compressive strengths at least one standard deviation above forty percent of the design strength ($0.4f'_c+\sigma$), the Engineer will provide for an appropriate adjustment under the provisions of 601.15.

INSERT THE FOLLOWING PARAGRAPH AFTER THE FIRST PARAGRAPH:

The maximum acceptable range of compressive strengths within a set of three cylinders is 9.5%. This range is found by multiplying 9.5% times the average compressive strength of the three cylinders. If this acceptable range is exceeded, the cylinder that varies the most from the average shall be discarded, and the remaining two cylinders shall be evaluated as outlined in the following paragraph.

The maximum acceptable range of compressive strengths within a set of two cylinders is 8.0%. This range is found by multiplying 8.0% times the average compressive strength of the two cylinders. If this acceptable range is exceeded, the entire test shall be discarded. Under no circumstances shall a compressive strength test consist of less than the average of two specimens.

DELETE THE LAST PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Whenever possible, the Division's statistical analysis will be based on a minimum of 10 cylinder test results. These results may be from the concrete item being placed, the same class of concrete on the project, or the same class of concrete from the producer. All of the cylinder test results used in this evaluation, however, must be from the same mix design.

ADD THE FOLLOWING SUBSECTION:

601.4.5- Tests for Permeability Acceptance: The Contractor shall be required to compare the compressive strength test results obtained in Section 601.4.4 to the compressive strength of the approved test mix per Section 601.3. This comparison shall be used as the acceptance criteria for the Chloride Permeability requirements. Chloride Permeability of the in-place concrete shall be considered acceptable if the 28-day compressive strengths obtained in Section 601.4.4 are greater than eighty percent of the 28-day compressive strength of the approved test mix. Concrete represented by compressive strengths below eighty percent of the 28-day compressive strength of the approved test mix may be removed and replaced by the Contractor. If the Contractor elects to leave the material in place, it will be evaluated as to adequacy for the use intended. All concrete evaluated as unsatisfactory for the use intended shall be removed and replaced or otherwise corrected by and at the expense of the Contractor as required in Section 105.3.

The Contractor shall also be required to fabricate six rapid chloride permeability test specimens in accordance with AASHTO T277 every time that a set of compressive strength specimens is fabricated. These test specimens shall be moist cured until as close to the time of test as possible. If the 28-day compressive strength of the in-place concrete (obtained in Section 601.4.4) is less than or equal to eighty percent of the compressive strength of the approved test mix, these rapid chloride permeability test specimens shall be tested in accordance with AASHTO T277, otherwise testing of these specimens is not required. When testing of these specimens is required, two test specimens shall be tested at each of the following ages: 35, 56, and 90 days. These test results shall be used by the Engineer as the basis for evaluation as to the adequacy of the material for the use intended.

601.5-EQUIPMENT AND TOOLS:

ADD THE FOLLOWING SUBSECTION:

601.5.4-Recording Thermometer: The Contractor shall supply a continuous recording thermometer capable of recording temperatures in the 30 - 150° F (1 – 66 °C) range. It shall likewise provide a recording capability over a 24-hour continuous period, minimum. The Contractor shall provide any ancillary equipment, supplies and labor necessary for calibration of this equipment.

601.6-HANDLING, MEASURING, AND BATCHING OF MATERIALS:

ADD THE FOLLOWING TO THE END OF THIS SECTION:

When microsilica densified powder is used, the densified powder shall be weighed using an approved cement scale or standard 25 lb. (11.3 kg) or 50 lb. (22.6 kg) full bags may be substituted. Batching tolerance for the cement plus densified powder shall be 1.0%.

Batching and mixing recommendations for bulk and bagged densified microsilica (silica fume) are provided in the Silica Fume Users Manual which is available through the Silica Fume Association (Report Number FHWA-IF-05-016).

These recommendations include procedures to be used when the Ready-Mix Supplier desires to add microsilica, which is supplied in repulpable bags, into the mix. If these recommendations are followed, and the Ready-Mix Supplier can satisfactorily demonstrate to the Engineer, by means of testing and wet-sieving a trial batch (see section 7.3.6 of the Silica Fume Users Manual), that there are no fragments of the packaging material remaining in the mix, then the restriction in section 501.7, concerning the addition of the pozzolan packaging material, may be waived.

The above referenced testing and wet-sieving of the trial batch shall be done on a plant-by-plant and mix-by-mix basis. When truck-mixed concrete is used, the truck which demonstrates the greatest degree of variability in the uniformity requirements, as specified in AASHTO M 157, shall be the truck which is used to produce the trial batch for testing and wet-sieving purposes. If the Ready-Mix Supplier intends to use this approach, it shall be addressed in the Plant portion of the Quality Control Plan.

601.7 – MIXING:

RE-WORD THE FOURTH PARAGRAPH AS FOLLOWS:

When placing concrete at remote locations, and due to excessive haul time to the site of work from the closest approved batch plant, and discharge of the concrete within the time limits specified in the previous paragraph is not possible, a concrete mix that includes a hydration control admixture may be used. The subject concrete mix containing this admixture must be approved in accordance with section 601.3.1, and the hydration control admixture must be approved in accordance with section 707.15. When conditions are such that a hydration control admixture is used, the allowable time between the introduction of the cement to the aggregates and discharge of the concrete shall be increased to three hours. The limit of 300 maximum revolutions (pertaining to truck mixers or agitators) specified in AASHTO M 157 may be waived when hydration control admixtures are used, provided that no additional water is added prior to discharge

of the concrete. A single batch of concrete containing a hydration control admixture may not be discharged on more than one project.

601.8 - FORMS:

601.8.1 - General:

DELETE THE FIRST PARAGRAPH REPLACE WITH THE FOLLOWING:

Forms shall be of wood, metal or other approved material and shall be mortar tight and sufficiently rigid to prevent distortion due to pressure of the concrete and other loads incidental to the construction operations including vibration. Wood forms shall be constructed and maintained so as to prevent the opening of joints due to shrinkage of the lumber.

ADD THE FOLLOWING SUBSECTION:

601.8.9 - Stay-in-Place Fabricated Metal Forms for Concrete Bridge Decks: All concrete bridge decks shall be constructed with a stay-in-place fabricated metal forming system per the requirements shown in this specification unless otherwise noted in the plans.

601.8.9.1 - General: Stay-in-place fabricated metal forms for concrete deck slabs of bridges shall be used on all interior bays of beams. For overhangs and where longitudinal expansion joints are located between stringers removable forms shall be used. The design and material of the forms, in the judgment of the Engineer, shall be such as to give an expected maintenance free service life equal to the service life of the concrete slab. The stay-in-place fabricated metal forms shall be crimped at each end.

Unless otherwise specified in the plans, the weight of stay-in-place fabricated metal forms plus concrete in the form flutes used in the design is 15 psf (74 N/m^2). The contractor shall submit revised computations if the proposed forming system is heavier than 15 psf (74 N/m^2). The cost of the revised computations shall be at no additional cost to the Division.

601.8.9.2 - Material: Stay-in-place fabricated metal forms for concrete decks slabs and exposed material for supports shall be zinc-coated (galvanized) steel sheet conforming to ASTM A-653, Designation SS, Grades 33 (230) through 80 (550), with a G165 Coating Designation. The stay-in-place fabricated metal forms shall be designed on the basis of dead load of the forms, reinforcement, and the plastic concrete plus 50 psf (2400 N/m^2) for construction loads. Unit working stresses shall be in accordance with the AASHTO LRFD Bridge Design Specifications for construction loads and the unit stress in the steel sheet shall be not more than 0.725 of the specified minimum yield strength of the material furnished but not to exceed 36,000 psi (250 Mpa). Maximum deflection under weight of plastic concrete, reinforcement and form shall not exceed 1/180

of the form span or ½" (13 mm), whichever is less. Maximum deflection under 60 psf (2900 N/m²) of live loads shall not exceed 1/360 of the form span or ¼" (6 mm), whichever is less. The form span for design and deflection shall be the clear distance between the flanges of the supporting beams less 2" (50 mm), measured parallel to the form flutes.

All stay-in-place fabricated metal forms shall have a minimum thickness of 22 gage.

Physical design properties shall be computed in accordance with requirements of American Iron and Steel Institute Specification for the Design of Cold-Formed Steel Structural members, latest published edition.

All reinforcing bars in the bottom layer of the deck slab reinforcement shall have a minimum concrete cover of 1" (25 mm). The distance from the top of the slab to the bottom layer of deck slab reinforcement shall not be less than that shown on the plans.

601.8.9.3 - Installation: All forms shall be installed in accordance with detailed fabrication plans submitted to the Engineer for approval. The fabrication plans shall clearly indicate locations where the forms are supported by steel beam flanges.

Form sheets shall not be permitted to rest directly on the top of the stringer or floor beam flanges. Sheets shall be securely fastened to form supports and shall have a minimum bearing length of 1" (25 mm) at each end. Form supports shall be placed in direct contact with the flange of stringer or floor beam. All attachments shall be made by bolts, clips, or other approved means. Welding of form supports to flanges shall not be permitted.

Any exposed form metal where the galvanized coating has been damaged shall be thoroughly cleaned and wire brushed, and then painted with two coats of zinc-rich primer, conforming to Subsection 711.21, to the satisfaction of the Engineer.

Transverse construction joints shall be located at the bottom of a flute and ¼" (6 mm) weep holes shall be provided in the field at 12" (300 mm) ± 3" (75 mm) on center along the line of the joint.

601.8.9.4 - Placement Of Concrete: Concrete shall be placed in accordance with the contract specifications. The entire form shall be filled with deck concrete. No filler material shall be permitted. Particular emphasis should be placed on proper vibration of the concrete to avoid honeycomb and voids, especially at construction joints, expansion joints, flutes, and ends of form sheets.

The use of covered flutes or fillers of any kind in the flutes of the stay-in-place fabricated metal forms is not permitted.

601.8.9.5 - Inspection: The Contractor's method of construction shall be carefully observed during all phases of the construction of the bridge deck. These methods include installation of the Stay-in-place fabricated metal forms; location and fastening of the reinforcement; composition of concrete, placement and vibration; and finishing of the bridge deck.

The Contractor shall remove at least one section of the forms at a location and time selected by the Engineer for each concrete placement in each approved pour sequence. This should be done as soon after placing the concrete as practicable in order to provide visual evidence that the concrete mix and the Contractor's procedures are obtaining the desired results. An additional section shall be removed each time the concrete mix or the Contractor's procedures are changed.

After the deck concrete has been in place for a minimum of two days, the concrete shall be tested for soundness and bonding of the forms by sounding on the forms with a hammer at least 50 percent of the area of at least 25 percent of the individual form panels, as selected by the Engineer on a random basis. If areas of doubtful soundness are disclosed by this procedure, the Contractor will be required to remove the forms from such areas for visual inspection.

At locations where sections of the forms are removed, the Contractor will not be required to replace the forms, but the adjacent metal forms and supports shall be repaired to present a neat appearance and assure their satisfactory retention. As soon as the form is removed, the concrete surfaces will be examined for cavities, honeycombing and other defects. If irregularities are found, and in the opinion of the Engineer these irregularities do not justify rejection of the work, the concrete shall be given a Class 1, Ordinary Surface Finish in accordance with the contract specifications and shall be repaired as the Engineer may direct. If the concrete where the form is removed is unsatisfactory, additional forms shall be removed, as necessary, to inspect and repair the slab, and the Contractor's methods of construction shall be modified as required to obtain satisfactory concrete in the slabs.

The amount of sounding and form removal may be moderated, at the Engineer's discretion, after a substantial amount of slab has been constructed and inspected if the Contractor's methods of construction and the results of the inspections as outlined above indicate that sound concrete is being obtained throughout the slabs.

The Contractor shall provide all facilities required for the safe and convenient conduct of the Engineer's inspection procedures.

601.8.9.6 - Forming System Changes: The contractor shall not utilize a removable forming system without the submittal of the following information:

1. Revised camber tables based on actual forming system.
2. Revised dead load deflection tables based on actual forming system.

These revised drawings must be stamped by a West Virginia Professional Engineer and approved by the Engineer prior to commencing forming. No change in unit prices, or contract completion date will be permitted for the use of a removable forming system.

ADD THE FOLLOWING SUBSECTION:

601.8.10 - Architectural Formwork:

601.8.10.1 - General: This work includes additional requirements for the forming of cast-in-place structural concrete designated as *architectural*. The scope of this work is as indicated and as detailed on the drawings.

601.8.10.2 - Submittals: The following shall be submitted to the Engineer for his review:

A. Product data and installation instructions for manufactured form systems, form liners, release agents, ties, and accessories. The release agent manufacturer shall certify that the products supplied comply with regulations controlling the use of volatile organic compounds (VOC's).
B. Shop drawings for fabrication and erection. These drawings shall show all items that visually affect the exposed concrete, including, but not limited to, general form construction, jointing, specially formed joints or reveals, and patterns of placement. The Engineer's review will be for general architectural applications and features only. Formwork design for structural stability and sufficiency is the Contractor's responsibility and shall not be submitted for the Engineer's review.
C. Mockup or Sample Panels. The Contractor shall submit a mockup or sample panel of their respective material indicating texture, finish, and pattern in accordance with Section 601.8.10.3.A. This Mockup or Sample Panel shall have a minimum front surface area of 15 ft^2 (1.2 m^2).

601.8.10.3 - Quality Assurance:

A. The Contractor shall construct a mockup or sample panel using the proposed formwork and facing materials in order to demonstrate the required finishes and textures. Actual construction of *architectural* concrete shall not proceed until the Engineer has accepted the sample units.
B. Before placing concrete, the Contractor shall check lines and levels of erected formwork, and shall make corrections and adjustments to ensure:
    1) proper size and location of concrete members
    2) stability of the forming systems
C. During concrete placement, the Contractor shall check formwork and related supports to ensure the forms are not displaced and that completed work will be within specified tolerances.

601.8.10.4 - Materials:

601.8.10.4.1 - Form Materials:

A. Forms for Exposed-Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood-faced or other paneled materials to provide as-cast surfaces. Furnish in largest sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form materials with sufficient thickness to withstand pressure of placed concrete without bow or deflection beyond allowable tolerances.

    1) Use overlaid plywood, APA grade trademarked "HIGH DENSITY OVERLAY (HDO)."
    2) Use plywood, APA grade trademarked "B-B PLYFORM CLASS 1."

B. Forms for Textured Finish Concrete: Provide special forming materials to produce surfaces with face design, texture, arrangement, and configuration as shown on drawings or as required to match Engineer's control sample. Provide solid backing and form supports to ensure stable textured form liners.
C. Form Coating: Provide a commercial formula release agent that will not bond with, stain, or adversely affect concrete. Provide material that will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede wetting surfaces to be cured with water or a curing compound.

601.8.10.4.2 - Formwork Design: Design formwork for easy removal without impact, shock, or damage to the concrete and adjacent materials.

601.8.10.5 - Construction Methods:

601.8.10.5.1 - Form Construction:

A. General: Construct forms to sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, chamfers, blocking, screeds, bulkheads, and other as required.
B. Fabricate forms to prevent cement paste from leaking while placing concrete and for easy removal without hammering or prying against exposed concrete surfaces. Provide crush plates where stripping might damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete. Solidly butt joints and provide backup material at joints to prevent leakage and fins. Assemble forms so that they may be easily removed without damaging exposed concrete surfaces

C. Provide temporary form openings where inaccessible formwork interior can be cleaned and inspected before placing concrete. Place temporary form openings as inconspicuously as possible, consistent with project requirements.
D. When drilling forms used for exposed concrete, drill from the contact face to the outside to suit the ties used and to prevent leakage of concrete mortar. Do not splinter the forms by driving ties through improperly prepared holes.
E. Unless otherwise shown in the plans,
    1) provide sharp, clean corners at intersecting planes with no visible edges or offsets.
    2) provide accurately formed chamfered corners using ¾ x ¾ inch (19 x 19 mm) strips, surfaced to produce uniformly straight lines and tight edge joints.

601.8.10.5.2 - Form Coatings:

A. General: Coat form contact surfaces with form-release agent before placing reinforcement. Do not allow excess material to accumulate in forms or to come into contact with reinforcement or surfaces that will be bonded to fresh concrete. Apply coating according to manufacturer's instructions.
B. Coat steel forms with non-staining, rust-preventative release agent, or otherwise protect from rusting. Rust-stained steel formwork is not acceptable.

601.8.10.5.3 - Reusing Forms: Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable. Clean and apply a new form-release agent to concrete contact surfaces.

601.9.1– Cold Weather Concreting:

ADD THE FOLLOWING TO THIS SECTION:

Class H or Class K Concrete Cold Weather Provisions: Cold weather periods shall be defined as those periods when temperatures above 50° F (10° C) do not occur for more than half of any 24 hour duration. The temperature of the surface on which the concrete is to be placed shall not be less than 45° F (7° C) immediately prior to placement of the concrete. During the cold weather periods, as defined above, the temperature of the concrete immediately after placement shall be between 55 and 75° F (13 and 24° C).

601.10-PLACING CONCRETE:

601.10.1-General:

ADD THE FOLLOWING SUBSECTIONS:

601.10.1.1 - Pre-Pour Meeting: The Contractor shall schedule a meeting prior to the start of the concrete work. The Engineer, Construction Manager, Prime Contractor, Concrete Contractor, Concrete Finisher, Concrete Supplier, and the Individual or Agency that will perform the quality control testing of the concrete shall attend. Topics of discussion shall include Class H concrete mixture proportions, batching, transporting, handling, placing, finishing, curing, and on-site quality control testing requirements.

601.10.1.2 – Concrete Placement Limitations: If the evaporation rate exceeds 0.10 lb./sq. ft. per hour (0.5 kg/sq. m per hour) (see Figure 1 Sect. 679.4.4), the Contractor shall make provisions (i.e. wind breaks, fogging, etc.) to reduce the rate prior to placing concrete. These provisions shall be maintained during the placement of the concrete. If the evaporation rate obtained from Figure 1 (Sect. 679.4.4) is close enough to the maximum allowable value of 0.10 lb./sq.ft. per hour (0.5 kg/sq. m per hour) that there may a discrepancy in the exact numerical value, the following equation shall be used to obtain a more accurate value.

$$E = [T_c^{2.5} - (r \times T_a^{2.5})] [1 + 0.4V] \times 10^{-6}$$

Where:

E	=	evaporation rate, $lb/ft^2/h$
T_c	=	concrete temperature, °F
T_a	=	air temperature, °F
r	=	(relative humidity %) / 100
V	=	wind velocity, mph

Example:

Air Temperature	=	65 °F
Relative Humidity	=	45%
Concrete Temperature	=	60 °F
Wind Velocity	=	20 mph

Result Using Figure 1:

Evaporation Rate ≈ 0.11 lb/ ft^2/h

Result Using Formula:

$$E = [T_c^{2.5} - (r \times T_a^{2.5})] [1 + 0.4V] \times 10^{-6}$$
$$E = [60^{2.5} - (0.45 \times 65^{2.5})] [1 + (0.4 \times 20)] \times 10^{-6}$$
$$E = [27885 - 15328] [1 + 8] \times 10^{-6}$$
$$E = 12557 \times 9 \times 10^{-6}$$
$$E = 0.11 \text{ lb/ } ft^2/h$$

Result Using Formula:

$$E = [T_c^{2.5} - (r \times T_a^{2.5})] [1 + 0.4V] \times 10^{-6}$$
$$E = [60^{2.5} - (0.45 \times 65^{2.5})] [1 + (0.4 \times 20)] \times 10^{-6}$$
$$E = [27885 - 15328] [1 + 8] \times 10^{-6}$$
$$E = 12557 \times 9 \times 10^{-6}$$
$$E = 0.11 \text{ lb/ ft}^2\text{/h}$$

601.10.1.4 – Concrete Placement at Night: If placement of any concrete is to be made at night, a plan which provides adequate lighting for the work area shall be submitted at least 14 days before concrete is placed for the Engineer's approval.

601.10.3 - Vibrating:

ADD THE FOLLOWING AT THE END OF THE SECTION:

The frequency of the vibrators shall meet the requirements of Section 501.5.5.

ADD THE FOLLOWING SUBSECTIONS:

601.10.4 - Placing Concrete Bridge Decks:

601.10.4.1 - Fogging Equipment: When Class H concrete is used, fogging equipment shall be available for use in accordance with these specifications. The fogging nozzles shall produce an atomized mist. Fogging nozzles shall incorporate compressed air to create the mist. Hand held or hand operated equipment shall be permitted when the Contractor has demonstrated that his operator has been trained in its use.

601.10.4.2 - Placement: The following requirements shall apply during placement of the Bridge Deck concrete:

a. So that the use of hand tools will be kept to a minimum, concrete shall be deposited as nearly as possible to its final position. Internal vibrators shall not be used for moving concrete into position.
b. A pencil type vibrator shall be used along all construction joints to further consolidate the concrete to prevent voids.
c. The new concrete shall be placed slightly above final grade. It shall then be struck-off, screeded, and finished to final grade.
d. The finished surface, before texturing, shall be uniformly smooth, dense and even. Variations in pavement surface in excess of 1/8 inch (3 mm) above, or below, the proper finished elevation, or surface irregularities of more than 1/8 inch (3 mm) in 10 feet (3 m), will not be accepted.
e. A construction dam, or bulkhead, shall be installed in case of a delay in the

placement operations exceeding 30 minutes duration. During any delays of 30 minutes or less, the placement shall be protected from drying with several layers of wet burlap. If the concrete placement is stopped, or delayed, for 90 minutes or more, further placement shall be discontinued and may be resumed only after the concrete has cured. This restriction does not prohibit continuation of the placement provided a gap is left in the placement. This gap shall be sufficient in length to allow the finishing machine to clear the previously placed concrete.

f. Adequate precautions shall be taken to protect freshly placed concrete from rainfall. All placement operations shall stop when it starts to rain. The Engineer may order removal and replacement of material damaged by rainfall.
g. The addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted.

601.11 - FINISHING CONCRETE SURFACES:

DELETE THE FIRST SENTENCE OF THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

The exposed surfaces of bridge parapets, wingwalls, headwalls and vertical edge of the bridge deck shall be given a Class 2, Rubbed Finish, or a Class 1, Ordinary Surface Finish supplemented with wood float rubbing.

ADD THE FOLLOWING:

Unless otherwise shown in the plans, all concrete designated as *architectural* shall receive a Class 1, Ordinary Surface Finish, as defined in Section 601.11.1.

ADD THE FOLLOWING SUBSECTIONS:

601.11.4 – Finishing Concrete Bridge Decks:

601.11.4.1 – Class H Bridge Decks

Surface Texturing: The surface of the Class H concrete shall be uniformly smooth, dense and even. The surface shall then be given a suitable texture with an approved burlap drag.

The Contractor shall texture in a transverse or longitudinal direction. Once begun, the direction of texturing shall not change. All texturing shall be performed prior to the beginning of curing operations. Only one pass of the drag over the finished area will be permitted. Texturing shall be in strict accordance with the time requirements of 601.12.4 for applying wet burlap.

If texturing is done in the transverse direction, the Contractor shall texture by hand methods as soon as practicable after finishing machine passage.

If texturing is done in the longitudinal direction, the burlap drag shall be a seamless strip and shall be attached to the work bridge such that the surface of the concrete is textured as soon as practicable after finishing machine passage. Small areas, inaccessible to the attached drag, may be textured by hand methods.

The finishing movement and resulting progress of the burlap drag shall be done in a manner so as to prevent ridges or gouges from forming in the concrete surface. The drag shall be weighted and the contact area changed as required to produce a texture acceptable to the Engineer. The drag shall be cleaned as required; to remove all hardened concrete particles.

Texture resulting from the drag shall stop within one foot (305 mm) of curbs or parapets.

Class H Concrete Finished Deck Grooving: After corrective grinding and before opening to traffic, grooves shall be cut into the concrete using a mechanical saw. These grooves shall be 0.10 inch (3 mm) wide and 0.25 inch (6 mm) deep. Groove spacing shall be 1.5 inches (38 mm) center to center. No later than one week prior to grooving operations, the Contractor shall provide the Engineer with two accurate, easily readable gauges with which to verify groove dimensions. Groove depth and spacing tolerances are limited to ±1/16 inch (±2 mm). Groove width tolerances are +0.02 (+0.5 mm) inch and -0.0 inch (-0 mm). The grooves shall be cut in a direction that is transverse to the centerline of the roadway or parallel to the skew. On any one bridge the direction of the grooves shall be consistent. Grooves shall be cut continuously across the deck to within one foot (305 mm) of gutter lines or drainage structures. Grooves shall also be continuous across the full width of the deck surface including construction joints. Grooves shall terminate within 1 inch (25 mm) of any exposed metal component or elastomeric concrete of an expansion joint. When the deck is skewed and the contractor is using gang blades to saw the grooves, the maximum distance (measured perpendicular to the centerline of the expansion joint) from the last groove termination in the pass to the expansion joint shall be 1 foot - 8 inches (508 mm). Radial grooving shall be performed in increments limited to 12 feet (3.7 m) of bridge length.

Saw Cutting Equipment: Only multi-bladed saw cutting equipment, using circular saw blades, will be permitted for final deck finish operations. The Engineer may allow the use of single blade circular saw equipment only where such equipment is necessary to complete the work as required.

ADD THE FOLLOWING SUBSECTION:

601.11.5 - Finishing Concrete Decks For the Placement of Specialized Overlay: When the plans require the placement of a Specialized Concrete Overlay, per Section 679, on a newly placed concrete deck, the concrete surface shall be intentionally roughened. The surface shall be raked and roughened to provide a surface profile that will facilitate the bond of the specialized concrete overlay. Floating of this surface shall be minimized to avoid formation of bleed water on the surface.

601.12 – CURING AND PROTECTING CONCRETE:

601.12.1-Curing Under Normal Conditions:

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Concrete surfaces shall be kept completely and continuously moist. Curing shall be continued for a period of at least 7 days. This curing period may be reduced if the contractor presents evidence that the in place concrete has attained 70% of the specified strength for the class of concrete under cure. Under no circumstances, shall the period of cure be less than 3 days. The reduced curing period option is not applicable to Class H or Class K concrete. Surfaces may have coverings temporally removed for finishing, but the covering shall be restored as soon as possible.

ADD THE FOLLOWING PARAGRAPH:

Curing Temperature is the air temperature at the concrete surface, or the air temperature between the concrete surface and its protective covering.

601.12.2 - Curing Under Cold Weather Conditions:

ADD THE FOLLOWING TO THIS SECTION:

Class H or Class K Concrete Provisions:

The surface temperature of the concrete shall be maintained between 55 and 75° F (13 and 24° C) for 72 continuous curing hours immediately after placement. After this 72 hour period, a minimum concrete surface temperature of at least 50° F (10° C) shall be maintained for an additional 96 continuous curing hours.

If it is expected that the surface temperature of the concrete will drop below 50° F (10° C) during the 168 hour curing period, then the surface shall be enclosed and external heat shall be provided in accordance with the provisions of this section. Once external heat provisions are required, they shall remain on the surface until curing is complete, regardless of the ambient air temperature. Enclosures for heat retention shall be properly vented to prevent surface disintegration from carbon dioxide gas.

Continuous wetting shall be replaced by wetting at regular intervals if, in the opinion of the Engineer, expected air temperatures could result in freezing of run-off water.

ADD THE FOLLOWING SUBSECTIONS:

601.12.4 – Curing Class H Concrete: It is the nature of Class H concrete material to quickly form a plastic film at the surface upon drying. This film is to be protected from drying and cracking by prompt covering with wet burlap. Regardless of the type of concrete placed, the use of membrane curing compounds will not be allowed. Floor drains shall be immediately unplugged to permit the deck to drain.

The concrete surface shall be completely covered with clean, wet burlap. The burlap shall be thoroughly saturated over its entire area, but shall be drained of excess water before application. Burlap shall be lapped a minimum of one foot (305 mm) and shall lay flat. Failure to apply wet burlap within 10 minutes after the concrete has been placed will be cause for rejection of the work as determined by the Engineer. However, the Engineer may extend time if the plastic film has not formed or the Contractor's fogging operation adequately protects the film. Care shall be exercised to ensure that the burlap is well drained. Burlap shall be continuously wet for a period of seven days by means of automatic intermittent sprinkling or a continuous wetting system.

601.13 - PROTECTIVE SURFACE TREATMENT:

601.13.1-Linseed Oil:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH:

The application of the linseed oil protective surface treatment is not required for elements constructed from Class H concrete.

ADD THE FOLLOWING SUBSECTION:

601.13.3 - Concrete Protective Coatings

601.13.3.1 - Concrete Surface Preparation: After the Engineer has inspected and accepted the concrete surfaces of bridges and median barriers as having a satisfactory ordinary surface finish, clean the concrete surfaces specified hereinafter of all dust, foreign matter, and form oil, and apply a Department approved protective coating finish. Coat the following surfaces, including all beveled edges:

1) Bridge Abutments and Wingwalls – Every exposed surface above a point six inches below ground or fill line. Exclude where epoxy coating is applied.
2) Bridge Pier Caps – The tops (including exposed surfaces of pads, pedestals, and keys), sides and ends. Do not apply the coating to bearing areas. Exclude where epoxy coating is applied.
3) Bridge Superstructure – The tops, inside and outside faces, and ends of all barrier walls, parapets, curbs, and points that will be exposed. Do not apply the coating to the riding surface of the bridge deck.
4) Exposed Surfaces of Substructure and the Superstructure – all surfaces identified in 1), 2), and 3) above and the underneath surfaces of slab overhangs that are outside of exterior girders and the exterior side and bottom of exterior beams or girders, the interior windows of barriers, and all exposed surfaces of piers and abutments. Extend the masonry coating from a point six inches below ground line to the top of the exposed surface.

Thoroughly clean all surfaces to receive a protective coating and keep them free of oil, form oil, grease, dust, dirt, mud, curing compound, release agents,

loose patching mortar, or any other substance that may prevent bonding. Before applying the protective coating material, fill all air holes flush with the surface with the protective coating material or an approved mortar to provide a uniform surface.

Check all surfaces to receive a protective coating for the presence of dust by wiping a dark cloth across the surface of the concrete. If a white powder can be seen on the dark cloth, clean the concrete by wire brushing, grinding, or water blasting and then allow it to thoroughly dry before applying the masonry coating. The Engineer will recheck the surface for the presence of dust after cleaning.

Check all surfaces to receive a protective coating for the presence of oily conditions by sprinkling or fogging water on the surface of the concrete. If the water stands in droplets without spreading out immediately, this indicates the surface is contaminated with an oily substance, and the Engineer will require cleaning using a detergent and water followed by thorough rinsing with water. The Engineer will recheck the surface for the presence of oil conditions after cleaning.

Thoroughly dry all surfaces to receive a protective coating before applying the coating, unless the coating manufacturer specifically recommends the surface to be wet. The Department's List of Approved Materials contains each manufacturer's recommendations. The Engineer will not consider surfaces to be dry unless an absorbent paper pressed tightly against the surface does not show any trace of moisture.

Suspend coating application any time the ambient temperature or the temperature of the concrete does not comply with the coating manufacturer's recommendations.

Prior to application of the materials, furnish the Engineer with copies of the coating material manufacturer's brochures or booklets. Apply protective coating materials in strict conformity with the manufacturer's written instructions and apply the material at a uniform rate of at least 50± 10 ft^2/gal (1.75± 0.35 m^2/L).

Satisfactorily repair or remove any portions of the coating that are not clean, uniform in color, texture, thickness, tightly bonded, or that are damaged before final acceptance of the project and replace them with an acceptable finish and coating.

Provide a neat uniform appearance, and prevent the coating from being dripped, sprayed, or otherwise deposited upon concrete and surfaces not designated to receive the coating. Remove any objectionable deposits or material and repair the surfaces to the Engineer's satisfaction.

601.13.3.2 - Concrete Protective Coating Materials:

Description: This section covers requirements for materials to be used as surface finishes for designated surfaces of cement concrete structures. The protective coatings must hide form marks, patches, and other minor irregularities and prevent deterioration, spalling, and other damage to the concrete due to the action of the weather and deicing chemicals.

Approval: Select masonry coatings from the Department's List of Approved Materials. Use a material that is readily recognizable by its name, trademark, container, or other feature. Conform to the Department's testing criteria to be placed on or remain on the Department's List of Approved Materials.

For initial approval submit representative samples, color chip(s), and duplicate copies of certified test reports to the Division of Materials for review and approval. An independent testing laboratory acceptable to the Department shall perform the tests described herein on representative samples of the material. Tests listed herein are the minimum testing requirements to be met. When requested in writing, the Engineer may accept materials based on conformance to the same type of test but differing on minor procedural points. Attach copies of test procedures which differ from those stated herein. In addition to the material, provide brochures or booklets containing detailed instructions and explanatory remarks about surface preparation, application procedures, and other pertinent operations.

A. Freeze-Thaw Test. Cast and cure 3 concrete specimens no less than 4 by 6 by 6 inches (100 by 150 by 150 mm). Moist cure specimens for 14 days and then dry in room air at 60° to 80° F (15° to 27° C) for 24 hours before applying protective coating. Ensure that there is no excessive oil on specimen forms. Coat sides of specimens (brush permitted) according to the manufacturer's directions at a rate of 50± 10ft^2/gal (1.75± 0.35 m^2/L) and cure at room temperature for 48 hours, after which:

    1) Immerse in water at room temperature 60° to 80° F (15° to 27° C) for 3 hours and remove.
    2) Place in cold storage at 5° F (-15° C) for one hour and remove.
    3) Thaw at room temperature, 60° to 80° F (15° to 27° C) for one hour.
    4) Repeat steps 1), 2) and 3) to complete a total of 50 cycles. At the end of 50 cycles of the Freeze/Thaw Test, ensure that the coated specimens show no visible defects.

B. Accelerated Weathering. Test according to ASTM D 822. Apply at an application rate of 50± 10 ft^2/gal (1.75± 0.35 m^2/L). Test for 335 hours in the Atlas Type XW Sunshine Arc Weatherometer or for 500 hours in an Atlas Type DMC Enclosed Violet Carbon Arc Weatherometer or equivalent. Perform the test in 120 minute cycles consisting of 102 minutes of light and 18 minutes of light and demineralized water. At the end of the exposure test, ensure that there is no checking, cracking, or loss in film integrity, and no other film defects. Ensure that the coating shows no more than very slight color change.

C. Salt Spray Resistance. Apply the masonry coating to concrete at a rate of 50± 10ft^2/gal (1.75± 0.35 m^2/L), and test the coating according to ASTM B 117. Expose the coating to a 5 percent sodium (salt) solution for 300 hours, and maintain it at 194° ± 4° F (90± 2° C) during the period of exposure. Ensure that it shows no loss of adhesion or deterioration at the end of the 300 hours.

D. Fungus Growth Resistance. Ensure that like protective coatings passes a fungus resistance test as described by federal specifications TT-P-29. After a minimum incubation period of 21 days, ensure that no growth is exhibited on the coatings.

601.14 - METHOD OF MEASUREMENT:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

The quantity of work done for Class A, Class B, Class C, Class D, Class H, and Class K concrete will be measured in cubic yards (meters), complete in place and accepted, as determined by the dimensions on the Plans or contract documents, and will be the number of cubic yards (meters) established in the Proposal, subject to adjustments provided for in 104.2 and 109.2.

The quantity of work done for Class H and Class K concrete will be measured in cubic yards (meters), complete in place and accepted, as measured from one end of the bridge to the other, fascia to fascia, and from the top of the forms to the finished elevation of the proposed deck surface. If stay-in-place prefabricated metal forms are used, an additional 1 inch (25 mm) of concrete over the area of stay-in-place prefabricated metal forms, will be used to measure the concrete that fills the form flutes. The stay-in-place prefabricated metal form area shall be as defined in the plans.

No deductions will be made for the volume occupied by pipe less than 8 inches (200 mm) in diameter, nor for reinforcing steel, anchors, conduits, weep holes or piling, or other small inserts.

The cost of copper, copper-nickel alloy or other type of flashing, expansion joint filler, preformed joint filler, concrete bearing pads, drain pipes for weep drains through abutments, wings and walls or bridge floors, unless otherwise specified, shall be included in the unit prices bid for the several classes of concrete.

All costs associated with the revised mix design and proportions shall be in the unit price bid for the class of concrete designated as *modified*.

All costs associated with architectural formwork shall be in the unit price bid for the class of concrete designated as *architectural*. No deductions will be made for the volume occupied by the architectural formwork.

The quantity of work done under line items 603.13.3 will include preparation and application of concrete protective coating to all exposed surfaces of special bridge railing, outside face of exterior prestressed girders, exposed portion of abutments, wingwalls and piers. The area to be coated will be measured on a square foot (square meter) basis.

601.15 - BASIS OF PAYMENT:

ADD THE FOLLOWING PARAGRAPH TO THIS SUBSECTION:

The cost of stay-in-place fabricated metal forms and all work associated therewith shall be included in the unit price bid for concrete placed as the bridge deck. The amount of concrete required to fill the form flutes is included in the plan quantity of the concrete bridge deck material, and shall be paid for per Section 601 of the Specifications.

The quantities determined as provided above, complete in place, will be paid under item 601019-* concrete protective coatings on a square foot (square meter) basis.

601.15.2-Price Adjustments:

CHANGE THE FORMULA TO THE FOLLOWING:

$$\text{Percent Reduction} = \frac{f_c^{'} - X}{0.6 f_c^{'} - \sigma}$$

Where: $f_c^{'}$ = Design Strength, psi (MPa)

X = Observed Strength, psi (MPa)

σ = Standard Deviation

601.16 - PAY ITEMS:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
601025-*	MODIFIED CONCRETE, CLASS y, zz PSI (MPA)	Cubic Yard (Meter)
601002-*	CLASS B CONCRETE, ARCHITECTURAL	Cubic Yard (Meter)
601003-*	CLASS K CONCRETE, ARCHITECTURAL	Cubic Yard (Meter)
601009-*	CLASS H CONCRETE	Cubic Yard (Meter)
601019-*	CONCRETE PROTECTIVE COATING	Square Foot (Square Meter)
601026-*	MODIFIED ARCHITECTURAL CONCRETE, CLASS y, zz PSI (MPA)	Cubic Yard (Meter)

* = Sequence number
y = Class of concrete
zz = Design 28-day Compressive Strength

SECTION 602
REINFORCING STEEL

602.9 - METHOD OF MEASUREMENT:

DELETE THE TABLE AND REPLACE WITH THE FOLLOWING:

TABLE 602.9

Bar Designation	Weight Per Lin. Ft. in Lb. (Mass kg per meter)	Bar Designation	Weight Per Lin Ft. in Lb. (Mass kg per meter)
# 3 (10)	0.376 (.560)	# 9 (29)	3.400 (5.060)
# 4 (13)	0.668 (.994)	# 10 (32)	4.303 (6.404)
# 5 (16)	1.043 (1.552)	# 11 (36)	5.313 (7.907)
# 6 (19)	1.502 (2.235)	# 14S (43)	7.650 (11.38)
# 7 (22)	2.044 (3.042)	# 18S (57)	13.600 (20.24)
# 8 (25)	2.670 (3.973)		

SECTION 603
PRESTRESSED CONCRETE MEMBERS

CHANGE THE MATERIAL REQUIREMENTS FOR CEMENT TO THE FOLLOWING:

603.2.1 - Materials Details: Materials shall meet the requirements specified in the following Sections/Subsections:

Precast / Prestressed Concrete Materials Sections / Subsections
Cement ..... ASTM C150, 701.3

DELETE THE FOLLOWING NOTE IN SECTION 603.2.1:

Fine aggregate shall be natural sand.

REPLACE WITH THE FOLLOWING:

603.2.1 – Materials Details

When the top surface of a prestressed member is designed as the bridge wearing surface, the fine aggregate shall be natural sand.

ADD THE FOLLOWING TO THE END OF THE SECOND PARAGRAPH:

603.4.2 - Shop Drawings

Design camber for all members shall be shown on the shop drawings.

603.6.2 - Shop Drawings

DELETE THE FIRST SENTENCE AND SUBSTITUTE THE FOLLOWING:

Concrete mixtures must be established initially by methods in accordance with ACI 318, Chapter 5.

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

All design mixes shall be developed using the type of cement, the type and gradation of aggregates, and admixtures proposed for use in plant mixes. The mix design shall also include either compressive strength tests or a penetration resistance test (in accordance with ASTM C 403) that verify the amount of time it takes to achieve a compressive strength of 500 psi (3.5 Mpa). The Engineer shall approve the mix design. When any of these variables are changed, or after a three-year time period, the mix shall be re-evaluated and submitted to the Engineer for approval.

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

603.6.4 - Sampling and Testing Methods

Sampling Freshly Mixed Concrete	AASHTO T 141
Slump of Hydraulic-Cement Concrete	AASHTO T 119
Unit Weight and Yield of Concrete	AASHTO T 121
Air Content of Freshly Mixed Concrete	AASHTO T 152 or AASHTO T 196
Making and Curing Concrete Test Specimens in the Field	AASHTO T 23
Compressive Strength of Cylindrical Concrete Specimens	AASHTO T 22
Temperature of Concrete	ASTM C 1064

Cylinders shall be manipulated and cured by methods identical to those used in curing the concrete members.

Slump, Temperature, and Air Content tests shall be conducted on the first batch of concrete each day and every time that cylinders are fabricated. Slump, Temperature, and Air Content tests shall also be conducted whenever Quality Control Personnel or the Inspector see a variation in the mix.

Unit Weight and Yield tests shall be conducted on the first batch of concrete each day and thereafter, as deemed necessary by Quality Control or Quality Assurance Personnel.

The Fabricator's Quality Control Personnel shall maintain records of the beam number(s) into which each batch of concrete is placed.

DELETE THE SECTION AND REPLACE WITH THE FOLLOWING:

603.6.5 - Strength of Concrete

Each strength test (i.e. strand release and 28-day) shall consist of the average strength of a minimum of two compressive strength test cylinders fabricated from a single randomly selected batch of concrete, as it is being placed in the forms.

A minimum of one set of cylinders shall be fabricated (at random) for each member cast in a form, with a maximum of one set of cylinders per batch of concrete. These cylinders, molded during fabrication, shall be the same size specimens as were used in the approved mix design.

DELETE THE SECOND AND THIRD PARAGRAPHS AND REPLACE WITH THE FOLLOWING:

603.9 - FINISHING

Top surfaces of prestressed members shall be screeded or rough floated to bring mortar to the surface and cover all aggregate. The top surface of members that will receive cast-in-place concrete on the project site shall be finished as noted on the project plans, or if no finish is noted, they shall have either a raked or stiff broom finish. Aggregate shall not be loosened when roughening the surface. The fascia surfaces of bridge members shall be finished with a PCI Grade A Formed Finish. All other members shall be finished with a PCI Standard Grade Formed Finish. Concrete on exposed reinforcing steel and loose laitance on concrete surfaces to be in contact with cast-in-place concrete shall be removed from all members.

Fabrication holes, except box beam vent holes, in the bottom of all beams, shall be filled with nonshrink mortar and made flush with the surrounding surface. No patching is required for small holes and irregularities on the sides of adjacent box beams that are to be sandblasted prior to shipment. Care shall be taken in final cutting the ends of strands to avoid damaging the concrete surface.

SECTION 604
PIPE CULVERTS

604.2 - MATERIALS:

DELETE THE FIRST PARAGRAPH ON PAGE 292 BELOW THE MATERIALS DESCRIPTIONS AND REPLACE WITH THE FOLLOWING:

* Fine aggregate used to level the bedding foundation shall consist of crushed or uncrushed natural or synthetic (blast furnace slag) mineral aggregate and consist of particles smaller than 3/8 inch (10 mm) as determined by visual inspection. Other synthetic aggregate may be used at the discretion of the Engineer.

604.2.1 - Quality Control Testing:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Quality control testing of the granular material and crushed aggregate backfill is the responsibility of the Contractor as specified in 106.1.

In the event any material does not conform to the specified gradation requirements the contractor's written certification shall reflect said nonconformance with quantities thereof. The contractor's gradation data for crushed aggregate backfill will be evaluated for specification compliance in accordance with applicable portions of section 307 of these specifications. The contractor's gradation data for granular materials shall be evaluated in accordance with 716.1.1.2. Each sample will be considered to represent a lot for the purposes of evaluation in accordance with the referenced sections. The certification is to include the results of testing from samples obtained at a minimum frequency of one sample per day of aggregate production, stockpiling or one sample per placement day, sampling from the working face of an existing stockpile.

A revised unit price for calculation purposes in 307.9.1 will be established based on the unit bid cost minus the cost of the pipe.

604.14 - PAY ITEMS:

DELETE ALL AFTER THE PAY ITEM TABLE AND INSERT THE FOLLOWING:

* Sequence Number
** Class designated by Roman numerals

Note: For Aluminum Box Culverts, haunch and crown plate thicknesses as specified on the Plans.

Note: Y = a letter, if present, designating base metal thickness or type of elliptical concrete pipe in accordance with the following table.
Z = a one digit number designating metal pipe corrugations or Roman numerals designating concrete pipe class or a one digit number designating elliptical concrete pipe class in accordance with the following table.

Y	Mil Thickness	
	Steel	Aluminum
A	64 (1.63)	60 (1.52 mm)
B	79 (2.0)	75 (1.90 mm)
C	109 (2.77)	105 (2.67 mm)
D	138 (3.51)	135 (3.43 mm)
E	168 (4.27)	164
F	188 (4.78)	---
G	218 (5.54)	---
H	249 (6.32)	---
J	4 BOLTS/FT (13 BOLTS/M) 280 (7.11)	--
K	6 BOLTS/FT (19 BOLTS/M) 280 (7.11)	100 (2.54 mm)
L	8 BOLTS/FT (26 BOLTS/M) 280 (7.11)	125 (3.18 mm)
M	313 (7.95)	150 (3.81 mm)
N	375 (9.52)	185 (4.41 mm)
P	---	200 (5.08 mm)
Q	---	225 (5.72 mm)
R	---	250 (6.35 mm)

Z	Metal Corrugations	Pipe Class
1	1½”x ¼” (37.5 x 6.25 mm)	---
2	2/3” x ½” (66.8 x 12.5 mm)	---
3	3” x 1” (75 x 25 mm)	---
5	5” x 1” (125 x 25 mm)	---
6	6” x 2” (150 x 50 mm)	---
7	7½” x ¾” x ¾” (190 x 19x 19)	---
I or 1	---	I
II or 2	---	II
III or 3	---	III
IV or 4	---	IV
V or 5	---	V

Y	Concrete Pipe
H	Horizontal Elliptical
V	Vertical Elliptical

SECTION 606
UNDERDRAINS

606.2 - MATERIALS:

INSERT THE FOLLOWING AFTER THE LAST PARAGRAPH:

606.2.1 - Quality Control Testing: Quality control is the responsibility of the contractor as specified in 106.1. The contractor shall develop a quality control plan in accordance with applicable sections of MP 307.00.50 excluding the attachment page.

Samples will be obtained at a minimum frequency of one sample per day of aggregate placement. Aggregate for underdrain shall be evaluated for specification compliance in accordance with MP 606.03.50. Aggregate for aggregate filled underdrain shall be evaluated for specification compliance in accordance MP 606.03.50 except Section 6.0 through 6.2 are excluded.

606.2.2 - Acceptance Testing: Acceptance sampling and testing of aggregates used for underdrain is the responsibility of the Division, Except for furnishing the necessary materials. Quality control sampling and testing performed by the Contractor may be used by the Division for Acceptance.

SECTION 607
GUARDRAIL

607.1 - DESCRIPTION:

ADD THE FOLLOWING CLASSES:

Class IV: 3 ft.	–	1 ½ in. (952 mm) post spacing without blocks.
Class V: 3 ft,	–	1 ½ in. (952 mm) post spacing with blocks.

ADD THE FOLLOWING PARAGRAPH

Tangent End Terminal Repair and Flared End Terminal Repair shall consist of carefully removing, and replacing the damaged components of the End Treatments. All components of the end treatment system shall be replaced with the respective manufacture's parts and are to conform to the original design of the system as outlined in the Standard Details Volume I and the manufacture's design.

607.2 – MATERIALS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Materials shall meet the requirements of the following Subsections of Division 700:

MATERIAL	SUBSECTION
Galvanized Steel Deep Beam Type Guardrail Fasteners and Anchor Bolts	712.4
Steel Guardrail Posts	709.45
Pressure Treated Wood Guardrail Posts	710.3, 710.5
Offset Blocks	710.3, 710.5 *
Zinc Rich Primer (Galvanized Repair)	711.21
Retroreflective Sheeting for Traffic Control	715.9.2.8
Concrete for Footers	715.12

* Other material types may be substituted from the division's approved list.

All materials must be protected from damage during storage and handling. All materials, including materials which have been approved previously, will be subject to inspection by the Engineer as to condition at any time prior to or during incorporation of the material in the work. Materials which have been damaged shall not be used.

607.6 – METHOD OF MEASUREMENT:

ADD THE FOLLOWING SUBSECTIONS

607.6.1 – Tangent End Terminal Components: Tangent End Terminal Repair will be measured from the percentage shown in tables 607.6.1A and 607.6.1B for the parts that are used and accepted. The Tangent End Terminal (TET) has two approved manufactures. The different components of each system along with how much percentage each part is to the entire system can be found in the following tables:

Table 607.6.1A (SKT 350) Approval #1318593A

Part #	Component Description		Value in Percentage (per each)
S3000	Impact Head		41.6%
S1303/S1305	#1 Deep Beam Guardrail 12 GA.	12.5’ or 25’ (3810 mm or 7620 mm)	2.1%
G1203/G1205	#2 Deep Beam Guardrail 12 GA.	12.5’ or 25’ (3810 mm or 7620 mm)	5.8%
E735	Foundation Soil Tube	6” x 8” x 4’-6” (152 x 203 x 1372 mm)	3.3%
SP600	Soil Plate	24” x 18” x ¼” (610 x 460 x 6 mm)	1.3%
E740	Pipe Sleeve		0.3%
E750	Bearing Plate	8” x 8” x 5/8” (200 x 200 x 16 mm)	0.8%
E760	Cable Anchor Box		2.3%
E770	BCT Anchor Cable Assembly		2.4%
E780	Ground Strut		2.1%
P650	Wood Posts	5.5” x 7.5” x 45” (140 x 190 x 1143 mm)	1.2%
P675	Timber Blockout	6” x 8” x 14” (150 x 200 x 360 mm)	0.4%
E3151	Impact Face Object Marker		1.5%

Table 607.6.1A (SKT 350) Approval #1318593A *continued* ***Hardware Package Consisting Of:***				
B580122	Splice Bolt		5/8" Dia. x 1 ¼" (16 mm Dia. x 32 mm)	4.5%
B580754	Hex Bolt		5/8" Dia. x 7 ½" (16 mm Dia. x 191 mm)	
B581004	Hex Bolt		5/8" Dia. x 10" (16 mm Dia. x 254 mm)	
B581002	H.G.R Bolt (Post 2 Only)		5/8" Dia. x 10" (16 mm Dia. x 254 mm)	
B581802	H.G.R Bolt (POST 3-8)		5/8" Dia. x 18" (16 mm Dia. x 457 mm)	
N050	H.G.R Nut	(Splice 16/32, soil tubes 22, Strut 2, Post 2-8, 7)	5/8" Dia. (16 mm Dia.)	
W050	H.G.R Washer		5/8" Dia. (16 mm Dia.)	
N100	Anchor Cable Hex Nut		1" (25 mm)	
W100	Anchor Cable Washer		1" (25 mm)	
E350	Lag Screw		3/8" x 3" (10 x 76 mm)	
SB58A	Cable Anchor Box Shoulder Bolts			
N055A	A325 Structural Nut		½" (10 mm)	
W050A	A325 STR. Washer		1 1/16" OD x 9/16" ID (27 mm OD x 14 mm ID)	

Table 607.6.1B (ET-2000) Approval #1318592A

Part #	Component Description		Value in Percentage (per each)
62G	#1 Deep Beam Guardrail 12 GA.		9%
60G	#2 Deep Beam Guardrail 12 GA.		5%
740G	Steel Tube	6” x 8” x 54” x 3/16 (152 x 203 x 1372 x 5 mm)	3.3%
766G	**Soil Plate**	24” x 18” x ¼” (610 x 460 x 6 mm)	1.3%
782G	Bearing Plate	8” x 8” x 5/8” (200 x 200 x 16 mm)	1.2%
704A	Cable Anchor Bracket		5.6%
3000G	Cable Assembly/ With Hex Nut & Washer	¾” x 6’6” (75 mm x 1950 mm)	3.5%
985A	Guardrail Extruder		63%
9918A	Offset Strut		2.8%
705G	Pipe Sleeve	2” Std. x 5 ½” (50 mm x 138 mm)	0.4%
4147B	Wood Posts	5.5” x 7.5” x 45” (140 x 190 x 1143 mm)	1.4%
4063B	Wood Posts	6” x 8” x 6’ (150 x 200 x 1800 mm)	2.4%
4148B	Wood Block	5.5” x 7.5” x 14” (140 x 190 x 360 mm)	0.5%
3177A	Object Marker		

Table 607.6.1B (ET-2000) Approval #1318592A *continued* ***HARDWARE PACKAGE CONSISTING OF:***				
3478G	Hex Bolt (Soil Plate)		5/8" Dia. x 7 ½"	0.6%
			(16 mm Dia. x 191 mm)	
3497G	Hex Bolt (Top Of Tube)		5/8" Dia. x 9 ½"	
			(16 mm Dia. x 238 mm)	
3360G	H.G.R Splice Bolts		5/8" Dia. x 1 ¼"	
			(16 mm Dia. x 31 mm)	
3580G	H.G.R Post Bolt		5/8" Dia. x 18"	
			(16 mm Dia. x 457 mm)	
3340G	H.G.R Nut	(Splice 16, tubes 24A/12B, gr-7)	5/8" Dia.	
			(16 mm Dia.)	
3300G	Washer (2 At Tubes 1 & 2 + 7 Posts)		5/8" Dia.	
			(16 mm Dia.)	
4228G	Lag Screw		3/8" x 4"	
			(10 x 100 mm)	

607.6.2 – Flared End Terminal Components: The Flared End Terminal (FET) has three approved manufactures. The different components of each system along with how much percentage the part is to the entire system can be found in the following tables:

Table 607.6.2A (FLEAT 350) Approval #1318589A

Part #	Component Description		Value in Percentage (per each)
S3000	Impact Head		40.4%
F1303	W-Beam Guardrail End Section, 12 GA		2.8%
F1304	W-Beam Guardrail Center Section, 12 GA		3%
G1203	W-Beam Guardrail, 12 GA		7.8%
S730	Foundation Soil Tube,	6" X 8" X 6' (152 x 203 x 1830 mm)	5.8%
Foundation Tube Options For Posts 1 & 2			
S730	*Split Foundation Tubes*	6'-0" (1830 mm)	
E371	*Solid Foundation Tubes*	6'-0" (1830 mm)	
SP600	*Foundation Tubes S375 W/Soil Plates*	5'-0" (1525 mm)	

SP600	*Foundation Tubes E735 W/Soil Plate*	4'-6" (1350 mm)	
E740	Pipe Sleeve		0.5%
E750	Bearing Plate	8" X 8" X 5/8" (200 x 200 x 16 mm)	1%
E760	Cable Anchor Box		3.1%
E770	BCT Cable Anchor Assembly		3.3%
E780	Ground Strut		2.8%
P650	Wood Posts	5.5" X 7.5" X 45" (140 x 190 x 1143 mm)	1.6%
P671	Wood CRT Posts	6" X 8" X 6' (150 x 200 x 1830 mm)	2.3%
P675	Timber Blockout	6" X 8" X 14" (150 x 200 x 360 mm)	0.5. %

Table 607.6.2A (FLEAT 350) Approval #1318589A continued
HARDWARE PACKAGE CONSISTING OF:

B580122	Splice Bolt		5/8" DIA. X 1 ¼" (16 mm Dia. x 32 mm)	4.9%
B580754	Hex Bolt		5/8" DIA. X 7 ½" (16 mm Dia. x 191 mm)	
B581004	Hex Bolt		5/8" DIA. X 10" (16 mm Dia. x 254 mm)	
B581002	Bolt (Post 2 Only)		5/8" DIA. X 10" H.G.R (16 mm Dia. x 254 mm)	
B581802	H.G.R. Bolt (Post 3-7)		5/8" DIA. X 18" (16 mm Dia. x 457 mm)	
N050	H.G.R. Nut	(Splice 24, Soil Tubes 2, Strut 2, Post 2, 1; Post 3 Thru 7, 5.)	5/8" DIA (16 mm Dia.)	
W050	H.G.R. Washers			
N100	Anchor Cable Hex Nut		1" (25 mm)	
W100	Anchor Cable Washer		1" (25 mm)	
E350	Lag Screw		3/8" X 3" (10 x 76 mm)	
SB58A	Cable Anchor Bow Shoulder Bolts			
N055A	A325 Structural Nuts		½" (13 mm)	
N050A	A325 Str. Washer		1 1/16" OD X 9/16" ID (27 mm OD x 14 mm ID)	

Table 607.6.2B (SRT-350) Approval # 1318590A

Part #	Component Description		Value in Percentage (per each)
3G	Backup (Guardrail) 12 GA	12” (3050 mm)	2.4%
34G	SRT-1 (Guardrail) 12 GA	12’6” (3810 mm)	12.8%
63G	SRT-350 (GUARDRAIL) 12 GA	25’/6’3 (7620 mm/227 mm)	16.2%
9G	(GUARDRAIL) 12 GA	12’6/6’3 (3810 mm/227 mm)	5%
35G	SRT-2 (GUARDRAIL) 12 GA	12’6/6’3 (3810 mm/227 mm)	12.8%
700A	Cable Anchor Bracket		2.6%
705G	Pipe	2” Ø x 5 ½” (50 mm Ø x 138 mm)	0.5%
736G	Tube Sleeve	5’ (1650 mm)	8.2%
766G	Soil Plate	24” x 18” x ¼” (610 x 460 x 6 mm)	2.4%
775G	Bearing Plate	8” x 6” x 5/8” (200 x 150 x 16 mm)	2.6%
923G	12 GA/Barrier (Terminal)	98” (2450 mm)	2.6%
3000G	Cable With Nut And Washer	¾ x 6’6 (75 x 1950 mm)	6.4%
9852A	Strut Assembly		5.1%
4075B	Block	6” X 8” X 14” (150 x 200 x 360 mm)	1%
4063B	Posts	6” X 8” X 6’ (150 x 200 x 1830 mm)	4.4%
9960A	Slot Guard		2.1%
4147B	Wood Posts	5.5” X 7.5” X 45” (140 x 190 x 1143 mm)	2.6%

Table 607.6.2B (SRT-350) Approval # 1318590A ***HARDWARE PACKAGE CONSISTING OF:***			
3360G	Splice Bolts	5/8” Dia. x 1 ¼” (16 mm Dia. x 31 mm)	10.3%
3500G	Post Bolt	5/8” Dia. x 10” (16 mm Dia. x 250 mm)	
3580G	Post Bolt	5/8” Dia. x 18” (16 mm Dia. x 457 mm)	
3340G	Hex Nut	5/8” Dia. (16 mm Dia.)	
3300G	Washer	5/8” Dia. (16 mm Dia.)	
3320G	Washer	3/16 x 1 ¾ x 3” (5 x 44 x 75 mm)	
3478G	Hex Head Bolts	5/8” Dia. x 7 ½” (16 mm Dia. x 187 mm)	
3380G	Hex Head Bolts	5/8” Dia. x 1 ½” (16 mm Dia. x 37 mm)	
3497G	Hex Head Bolts	5/8” Dia. x 9 ½” (16 mm Dia. x 237 mm)	
9961G	Plate Washer	3/8 x 3 x 4 (10 x 75 x 100 mm)	
5968G	16d Standard Nail		
3900G	Washer	1” (25 mm)	
3910G	Hex Nut	1” (25 mm)	

Table 607.6.2C (REGENT) Approval # 318591A

Part #	Component Description	Value in Percentage (per each)
PTE05	Foundation Tube, ST, G	10.5%
PLS03	Soil Plate, St, G	1.5%
PFP01	Strut & Yoke Assemble, ST, G	4.5%
Regent Post 1	Regent Post 1	11%
Regent Post 2	Regent Post 2	4%
FAC PLT WLD	Regent Face Plate Weldment	3.5%
Rein Panel	Regent Rein Panel Weldment	4.4%
Brace	Brace Ch Standard	4%
Brace Support	Brace Support ¼ x 5" (7 x 125 mm) Bent With Holes	4%
FPA01	Cable Anchor Box	2%
FCA01	Cable Anchor, Nut And Washers	1.5%
CBL Arch SLV	Cable &Anchor Sleeve	3.5%
Bearing SLV	Regent Bearing Sleeve, Half	6%
Regent Line Po	Regent Line Post, Mod 2 ½" (63 mm) Holes	2%
PDB01	Timber Post Blockout	4%
Regent Rail 1	Regent Rail 1 (Mod Twm14a)	12%
Regent Rail 2	Regent Rail 2 (Mod Twm14a)	8%
Rwm04a	Regent Rail 3 (Rwm04a Or Rwm02a)	5.5%
Fpp02	"L" Shelf Angel Bracket	1.5%
Rwb01a	W-Beam Backup Plate	1.5%

Table 607.6.2C (REGENT) Approval # 318591A continued ***HARDWARE PACKAGE CONSISTING OF:***			
FBB01	Guardrail Bolt & Rail Nut	5/8" Dia. x 1 ¼"	5.1%
		(16 mm Dia. x 32 mm)	
FBB03	Guardrail Bolt & Nut, Hex Head	5/8" Dia. x 10"	
		(16 mm Dia. x 254 mm)	
FBB04	Guardrail Bolt & Nut, Hex Head	5/8" Dia. x 18"	
		(16 mm Dia. x 457 mm)	
FBX16a1	Hex Bolt & Hex Nut	5/8 x 1 9/16	
		(16 mm x 39 mm)	
FBX16a2	Hex Bolt & Hex Nut	5/8 x 7 7/8	
		(16 mm x 197 mm)	
FBX16a3	Hex Bolt & Hex Nut	5/8 x 9 7/8	
		(16 mm x 247 mm)	
FWC16a	Flat Washer, G	11/16" ID x 1 ¾" OD	
		(17 mm Dia. x 44 mm)	
FW4R03	Rectangular Guardrail Washer		

Standoff	Standoff	7/8 x 5/8 x ¼	
		(21 mm OD x 16 mm ID x 7 mm)	
C Bracket	C Bracket Bent With Hole	¼ x 6”	
		(7 mm x 150)	
Post Breaker	FTB ST With Holes	¼ x 3 x 16	
		(7 x 75 x 400 mm)	
Post Breaker	ANG ST With Hole	¼ x 3 x 3x 9	
		(7 x 75 x 75 x 225 mm)	
N16D	Nail, 16D, G		

607.7 – BASIS OF PAYMENT:

ADD THE FOLLOWING AFTER THE SECOND PARAGRAPH

Tangent End Terminal Repair and Flared End Terminal Repair will be paid for at the percentage calculated above of the unit price bid for that item.

607.8 – PAY ITEMS:

ADD THE FOLLOWING ITEMS

ITEM	DESCRIPTION	UNIT
607081-*	TANGENT END TERMINAL REPAIR, “system name”	Each
607082-*	FLARED END TERMINAL REPAIR, “system name”	Each

* Sequence number

SECTION 609
SIDEWALKS

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

609.1 - DESCRIPTION:

This work shall consist of the construction of Portland cement concrete sidewalks in accordance with these Specifications and in reasonably close conformity with the lines and grades shown on the Plans or established by the Engineer.

DELETE THE HEADINGS AND CONTENTS AND REPLACE THE FOLLOWING:

609.2 – Detectable Warning Surfaces: Detectable warning panels shall have a detectable warning surface meeting ADAAG requirements. The panel dimensions shall not deviate more than 1/16 in (3 mm). The panel colors shall be as shown in the plans or as approved by the engineer. The detectable warning panels shall contrast to the adjacent sidewalk, sidewalk flares and pavement. The panels shall have a minimum skid resistance of .60 wet when tested with ASTM C 1028.

There shall be two types of warnings surfaces: Panels for fresh concrete surfaces while the concrete is still plastic, and products for cured concrete surfaces. Products and application methods must be approved and on the WVDOH Approved Products List. All materials to be used shall be covered by a 3 year warranty under normal conditions.

A wet or plastic set in place system shall be performed at the time of the placement of the sidewalk, while the concrete is still plastic. Mould-in-place concrete domes, brick pavers or iron or steel warning systems shall not be used.

609.2.1 Approved Products Listing: Material approvals for detectable warning panels will be based on results from a WVDOH field evaluation tests. Detectable warning systems may also be accepted or rejected based on actual performance on WVDOH projects. No bricks, iron, or set in place concrete domes or paint will be accepted. A list of approved materials, code numbers, and approved Contractor personnel may be obtained by contacting:

Materials Control, Soils, & Testing Division
190 Dry Branch Road
Charleston, West Virginia 25306

CONSTRUCTION METHODS

609.3 - SUBGRADE PREPARATION:

The subgrade shall be constructed true to grade and cross section as shown on the Plans or directed by the Engineer. It shall be watered, if required, and thoroughly compacted before placing the concrete or bed course material. All soft and yielding material shall be removed and replaced with suitable material.

The completed subgrade shall be tested for grade and cross section by means of a template supported on the side forms.

609.4 - DRY BED:

When called for on the Plans, bed course material shall be placed on the subgrade to the depth and width specified and compacted.

609.5 - FORMS:

Forms shall be of wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. All forms shall be cleaned and oiled before being used.

609.6 - MIXING AND PLACING CONCRETE:

The foundation and surfaces not oiled shall be thoroughly moistened immediately prior to the placing of the concrete. The proportioning, mixing, and placing of the concrete shall be in accordance with the requirements for the class of concrete specified.

609.7 - EXPANSION JOINTS:

Expansion joints ¼ inch (6 mm) wide shall be constructed at 30 ft. (9 m) intervals, at all returns, and opposite expansion joints in adjacent curb. A longitudinal expansion joint ¼ inch (6 mm) wide shall be placed between sidewalk and curb. Expansion joints shall be filled with preformed joint filler, which shall be shaped to fit the concrete section being placed.

Where sidewalks are to be placed around or adjacent to manholes, drop inlets, or other miscellaneous structures in sidewalk areas, such structures shall not be constructed to final grade until after the sidewalk has been constructed for a reasonable distance on each side of the structure. Expansion joints, of the type specified above, shall be constructed between all such appurtenances and the sidewalk.

Expansion Joints shall be provided around all sidewalk ramps and ramp flares.

With the approval of the Engineer, preformed filler in longitudinal expansion joints between sidewalks and curbs may be eliminated, and the opening remaining after sidewalk has been placed shall be filled with joint sealing material.

609.8 - FINISHING:

609.8.1 - Concrete: Fresh concrete shall be struck off and compacted until a layer of mortar has been brought to the surface. The surface shall be finished to grade and cross section with a float, troweled smooth, and finished with a broom. The float shall be not less than 10 feet (3 m) in length and not less than 6 inches (150 mm) in width. Brooming shall be transverse to the line of traffic, and the broom shall be kept clean.

All outside edges of the slab and all joints shall be edged with a ¼ inch (6 mm) radius edging tool.

The surface of sidewalks shall be marked into rectangles of not less than 12 sq. ft. (1 sq. m) with a scoring tool which will form dummy joints and rounded sidewalk edges. The dummy joints shall extend into the concrete inch (9 mm) depth and shall be approximately 1/8 inch (3 mm) wide.

The finished surface shall not vary more than ¼ inch (6 mm) from a 10 ft. (3 m) straightedge, except at grade changes, and shall be free from blemishes.

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

609.8.2 Detectable Warning Surface: The detectable warning panels may be designed for placement while the concrete is plastic or after the concrete has cured. The sidewalk concrete shall cure a minimum of 72 hours prior to placement of the detectable warning surface. The area where the surfaces are to be installed in shall be thoroughly cleaned and allowed to dry. The joints between the panels shall not exceed 1/8 inch. The panels shall not deviate more than 1/16" from the finished grade of the ramp surface. The grade will be measured from the top of the panel excluding any texture. The panels shall be cut as recommended by the manufacture. The domes shall be aligned in the direction of pedestrian travel.

609.9 - CURING:

Concrete shall be cured for at least 72 hours. Curing shall be by means of moist burlap mats, membrane curing compound, vapor barrier, or by other approved methods. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as the Engineer may direct.

609.10 - METHOD OF MEASUREMENT:

Sidewalks will be measured in square yards (meters), complete in place and accepted, which will be determined by the length measured upon the surface times the width constructed, as authorized by the Engineer. The detectable warning surface of the sidewalk ramp shall not be paid for separately but shall be incidental to the sidewalk construction. Bed course material will be measured by the cubic yard (meter), complete in place and accepted. Where a driveway crosses a sidewalk, the intersecting area shall be constructed to the driveway specifications and shall not be measured for payment as sidewalk area.

609.11 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payment shall be full compensation for furnishing all the materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

609.12 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
609001-*	Concrete Sidewalk	Square Yard (Meter)
609002-*	Bed Course Material	Cubic Yard (Meter)
609005*	Curb Ramp	Each
609006*	Detectable Warning Installation	Lump Sum

* Sequence number

SECTION 612
TUNNEL LINER PLATE PIPE

612.9 - PAY ITEMS:

DELETE PAY ITEM TABLE AND SUBSTITUTE THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
612001-*	"size" TUNNEL LINER PLATE PIPE, 2-FLANGE DESIGN, Y	Linear Foot (Meter)
612002-*	"size" TUNNEL LINER PLATE PIPE, 4-FLANGE DESIGN, TYPE "type", Y	Linear Foot (Meter)

* Sequence number

SECTION 615
STEEL STRUCTURES

615.1.3 - Inspection:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Structural steel shall be inspected in the fabrication shop. The Contractor shall furnish the Engineer with a copy of all mill orders and shop lists showing heat numbers to be used for each piece. Mill test reports that document the chemical analysis and physical test results for each heat of steel to be used in the work shall also be furnished. Final approval of the material in the shop will not be given until the above data is approved.

ADD THE FOLLOWING SUBSECTION:

615.2.1 - Shop Drawings: The Contractor shall submit copies of the detailed shop drawings to the Engineer for approval. Shop drawings shall be submitted sufficiently in advance of the start of the work to allow time for review by the Engineer and corrections to be made by the Contractor without delaying the work. Upon completion of the work, reproducible, full-size tracings of the original drawings shall be delivered to the Engineer. The size of the original

drawings shall be 22 inches (559 mm) x 34 inches (864 mm), including margins, unless otherwise permitted. The shop drawings submitted for approval may be of a reduced size.

The title block of all sheets of the shop drawings shall contain at a minimum the following: state project number, federal project number, bridge name, bridge (design) number, prime contractor's name and fabricator's name.

Shop drawings shall give full detailed dimensions and sizes of component parts of the structure and details of all miscellaneous parts, such as pins, nuts, bolts, drains, etc.

Where specific orientation of plates is required, the direction of rolling of plates shall be shown.

Shop drawings shall specifically identify each piece that is to be made of steel which is to be other than AASHTO M 270 (M270M) Grade 36 (245) steel.

615.3.3 - Welded Stud Shear Connectors:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH:

The connectors shall be attached in the field. No shop installation of welded stud shear connectors shall be permitted. The field installation of the welded stud shear connectors shall not commence prior to the installation of the deck forms in the area surrounding the welded stud shear connectors. Overhanging deck forms may be installed after the welded stud shear connectors are installed. The welded stud shear connectors and deck forms shall be installed in a sequence that permits workers access through the deck area without walking through installed welded stud shear connectors.

ADD THE FOLLOWING SECTION:

SECTION 616
PILING

616.1 - DESCRIPTION:

This work shall consist of furnishing and driving concrete, or steel bearing piles, of the kind and dimensions designated, to the required bearing or penetration in accordance with these Specifications and in reasonably close conformity with the lines and spacing shown on the Plans or established by the Engineer.

616.2 - MATERIALS:

Materials shall conform to the requirements specified in the following sections/subsections:

MATERIAL	SUBSECTION
*Steel Bearing Piles and Splices	709.12
Prestressed concrete piles	603
Precast concrete piles	601
Steel Pile Points	709.50

* The piling section shall be of the H form and with total flange width substantially equal to the depth of the section. No section shall have a thickness of metal less than 0.4 inches (10 mm), nor a depth less than 8 inches (200 mm).

CONSTRUCTION METHODS

616.3 - PREPARATION FOR DRIVING:

616.3.1 - General: Piles shall not be driven until required excavation or embankment is completed. Material forced up between the piles shall be removed to correct elevation, without cost to the Division, before concrete for the foundation is placed.

616.3.2 - Caps: The heads of all concrete piles shall be protected by caps of approved design, preferably having a rope or other suitable cushion net to the pile head, and fitting into a casting which, in turn, supports a timber shock block when the nature of the driving is such as to unduly injure them. A cast or structural steel cap or driving head shall be used for driving steel piles, if required, to keep the pile heads from upsetting excessively under hard driving conditions.

616.4 - EQUIPMENT FOR DRIVING:

616.4.1 - General: When a steam or air hammer is used for driving any type of piles, both the volume and pressure of steam or air recommended by the manufacturer of the hammer, as well as the rated number of strokes per minute, shall be maintained at all times to insure full energy of the driving blows.

Before pile driving is started, the Contractor shall provide written certification to the Engineer that the pile hammer, air compressors, and air valves have been inspected and found to be in good working condition.

In case the required penetration is not obtained by the use of a hammer complying with the minimum requirements in 616.4.2 and 616.4.3, the Contractor shall provide a heavier hammer or resort to jetting at their own expense, unless jetting is specifically prohibited.

616.4.2 - Hammers for Steel Piles: Gravity hammers for driving steel piles shall weigh not less than 2,000 and 3,000 lb. (907 to 1 360 kg) respectively, and in no case shall the weight of the hammer be less than the combined weight of the driving head and pile, unless noted otherwise on the Plans. The fall shall be so regulated as to avoid injury to the piles and in no case shall exceed 15 ft. (4.5 m).

Steam or air hammers used for driving steel piles shall develop an energy per blow, at each full stroke of the piston, of not less than 12,000 ft.-lb. (16.3 kJ) unless noted otherwise on the Plans.

616.4.3 - Hammers for Concrete Piles: Steam or air hammers used for driving precast concrete piles with a mandrel shall develop an energy per blow, at each full stroke of the piston, of not less than 15,000 ft.-lb. (20.3 kJ) or not less than one foot-pound for each pound of weight driven.

616.4.4 - Leads: Pile driver leads shall be constructed in such a manner as to afford freedom of movement to the hammer, and they shall be held in position by guys or still braces to insure firm support to the pile during driving to the lowest point the hammer must reach.

616.4.5 - Water Jets: When water jets are used, the numbers of jets and the volume and pressure of water at the jet nozzles shall be sufficient to freely erode the material adjacent to the piles. The plant shall have sufficient capacity to deliver at all times at least 100 psi (689 kPa) pressure at two ¾ inch (19 mm) jet nozzles.

616.5 - METHOD OF DRIVING:

Precast concrete piles shall be driven by means of a combination of steam or air hammer and water jet, but the water jet may be omitted if approved by the Engineer. Other piles shall preferably be driven with an approved steam or air hammer, an approved diesel hammer, or a combination of these hammers, and water jet, except that jetting of steel piles will not be permitted unless special written permission of the Engineer is obtained. The jets, if used, shall be withdrawn before the desired penetration is reached, and the piles shall be driven with the hammer to secure the final penetration.

Pile driver leads shall be used in driving unless otherwise directed by the Engineer in writing. Underwater hammers may be used only when held in rigid leads extending to the full depth.

616.6 - ACCURACY OF DRIVING:

All piles shall be driven with a variation of not more than 2% from the vertical or from the batter line indicated. The plan elevation for cut off shall be measured from the lowest point of the pile head with a maximum deviation of 2 inches (50 mm) above plan cut off providing this deviation does not interfere with other construction requirements. The cut off shall be made at right angles to the pile. The concrete cover from the face of the concrete to any face of the pile shall not be less than 9 inches (225 mm) except on the side the pile penetrates the structure. Additional concrete cover may be monolithically added to the structure to maintain the minimum 9 inches (225 mm) cover at no cost to the Division.

616.6.1 - Foundations: The location in plan for piles in foundations may have a maximum deviation of 6 inches (150 mm) from that shown in the contract documents except as provided in 616.6.2.

616.6.2 - Abutments with Single Lines of Piles: The location in plan for piles in an abutment with a single line of piles may have a maximum deviation of 3 inches (75 mm) from that shown in the contract documents.

616.6.3 - Combination Pile and Trestle Bents: The location of the top of a combination pile and trestle bent may have a maximum plan deviation of 1 1/2 inches (38 mm).

616.7 - DEFECTIVE PILES:

The procedure incident to the driving of piles shall not subject them to excessive and undue abuse producing crushing and spalling of concrete or deformation of the steel. Any pile driven out of its proper location or any pile damaged by reason of internal defects or by improper driving shall be removed or, at the option of the Engineer, a second pile may be driven adjacent thereto if this can be done without detriment to the structure. All piles so driven shall be at the expense of the Contractor.

616.8 - DETERMINATION OF BEARING VALUES:

616.8.1 - Loading Tests: When required, the size and number of piles shall be determined by actual loading tests. In general, these tests shall consist of the application of a test load placed upon a suitable platform supported by the pile, together with suitable apparatus for accurately measuring the load and the settlement of the pile under each increment of load. The safe allowable load shall be considered at 50% of that load which produces a permanent settlement not greater than 3 inches (75 mm), measured at the top of the pile, after 48 hours of application. This maximum settlement shall not be increased by a continuous application of the test load for a period of 60 hours. In general, one pile for each group of 100 piles shall be tested.

616.8.2 - From Blow Count at Refusal: The size of piles, energy rating of hammer, and design load will be designated on the Plans. All piles shall be driven to refusal into the foundation strata as indicated by the estimated pile lengths or pile tip elevations. Refusal is defined as the equivalent of 20 blows for 1 inch (25 mm) of penetration with a power hammer developing the minimum designated foot pounds per blow. The minimum number of blows in the last inch of penetration shall be as specified on the Plans. If a larger hammer is used, the Engineer will specify the blow count to determine refusal.

616.9 - PRECAST CONCRETE PILES:

616.9.1 - General: Precast concrete piles shall be constructed in accordance with the size, shape, and reinforcement, shown on the Plans.

Class B concrete shall be used, and the applicable provisions of 601 shall govern.

616.9.2 - Formwork: Forms for precast concrete piles shall conform to the general requirements for concrete form work as provided in 601. Forms shall be accessible for tamping and consolidation of the concrete. Under good weather conditions, side forms may be removed 24 hours after placing concrete, but the entire pile shall remain supported for at least seven days and shall not be subjected to any handling stress until the concrete has set for at least 14 days or for a longer period in cold weather, according to the judgment of the Engineer. Where control cylinders are made, bottom forms may be removed when the concrete has developed a compressive strength of 2,000 psi (14 MPa).

616.9.3 - Placing and Finishing: Piling may be cast in either a vertical or horizontal position. Special care shall be taken to consolidate the concrete around the reinforcement and to avoid the formation of stone pockets, honeycomb, or other such defects. To secure uniformity and remove surplus water, the concrete in each pile shall be placed continuously and shall be compacted by vibrating or by other means satisfactory to the Engineer. The forms shall be overfilled, the surplus concrete screeded off, and the top surfaces finished to uniform, even texture similar to that produced by the forms.

As soon as the forms are removed, concrete piles shall be pointed with a 1 to 2 mortar and finished. Trestle piling exposed to view shall be finished above the ground line in accordance with the provisions governing the finishing of concrete columns. Foundation piling and that portion of the trestle piling which will be below the ground surface shall not be finished except by pointing as specified.

616.9.4 - Curing: Concrete piles shall be cured in accordance with the general provisions governing the curing of concrete as specified in 601. As soon as the piles have hardened sufficiently, they shall be removed from the forms and placed in a curing pile, separated from each other by wood spacing blocks. No pile shall be driven until it has cured for at least 21 days and in cold weather for a longer period as determined by the Engineer.

616.9.5 - Handling: Removal of forms, curing, storing, transporting, and handling precast concrete piles shall be done in such a manner as to avoid excessive bending stresses, cracking, spalling, or other injurious results. Piles shall be lifted by means of suitable bridles or slings attached to the pile along its length. The arrangement shall be such that no stresses in excess of 12,000 (82.7 MPa) psi are developed in the reinforcement, and the maximum compressive stress in the concrete is not over 600 psi (4 Mpa) allowing 100 % of the calculated load for impact and shock.

616.10 - PRESTRESSED CONCRETE PILES:

Prestressed concrete piles shall conform to the requirements of 603.

616.11 - STEEL PILING:

616.11.1 - General: Steel piles shall consist of structural steel shapes of the kind and size specified. Full-length steel piles shall be used where practicable. Splicing of piles is permitted subject to the approval of the Engineer and shall be in accordance with this Specification. The number of welded connections in the length of a pile shall be preferably as few as practicable.

616.11.2 - Splicing Steel Piles: If splices are made in steel piles by welding, the abutting surfaces must be true planes. The top surface of the lower pile shall be straightened if bent during the driving process or cut off (flame cutting permitted, 615.4.3.2.2) below the bent portion if it cannot be satisfactorily straightened. The bottom surface of the upper pile shall be beveled on the inside edges of the flanges and along one edge of the web. The bevel shall be made at an angle of approximately 40° with the horizontal. A surface of 1/8 inch (3 mm) may be left unbeveled. The upper pile shall be securely clamped to the lower pile and separated there from 1/8 inch (3 mm), care being taken to make the axis of the two piles coincide. The entire periphery of the pile joint shall then be butt welded, by properly certified welders, with sufficient passes to completely fill the joint, the slag of each pass being removed before beginning the next pass.

616.11.3 - Cutting off Steel Piles: Steel piles shall be cut off at the required elevation. If capping is required, the connection shall be made according to details shown on the Plans.

616.12 - PREDRILLED PILING:

Holes shall be drilled or bored through the fill material to original ground or into the rock strata, when specified on the Plans, before driving the piles. The predrilled holes for H-piling shall have a diameter of approximately 85 % of the depth of the pile section when the piling is not required to penetrate into rock and shall be a minimum of 100 % of the diagonal dimension of the pile section when the piling is required to be socketed into rock. Holes for round piles may vary from 2 inches (50 mm) less to 4 inches (100 mm) more than the diameter of the pile, the exact diameter to be approved by the Engineer to produce satisfactory pile driving results.

All voids remaining after driving operations shall be filled with concrete sand or other aggregate of a size no larger than No. 8. Test requirements for this material are waived, except that the material shall be dry and free flowing in order to fill the voids around the piles to the satisfaction of the Engineer.

616.13 - EXTENSIONS OR "BUILD-UPS":

Extensions, splices or build-ups on concrete piles, when necessary and permitted by the Engineer, shall be made as follows:

After the driving is completed, the concrete at the end of the pile shall be cut away, leaving the reinforcement steel exposed for a length of 40 diameters. The final cut of the concrete shall be perpendicular to the axis of the pile. Reinforcement similar

to that used in the pile shall be securely fastened to the projecting steel and the necessary formwork shall be placed, care being taken to prevent leakage along the pile. The concrete shall be of the same quality as that used in the pile. Just prior to placing concrete, the top of the pile shall be thoroughly wetted and covered with a thin coating of neat cement, retempered mortar or other suitable bonding material. The forms shall remain in place not less than seven days and shall then be carefully removed and the entire exposed surface of the pile finished as specified in 616.9.3.

616.14 - METHOD OF MEASUREMENT:

The number of linear feet (meters) of piles of the type specified to be paid for will be the actual length of piles remaining in the finished structure. All cut-offs remain the property of the Contractor for disposition.

Extension, splices, or "build-ups" will not be measured for payment as such, but, they will be included as footage in the length of piling remaining in the finished structure. In determining the amount to be included, no allowance will be made for cut-offs necessary to accomplish the extensions, splices, or "build-ups".

"Pile Loading Tests" will be measured separately and will be the actual number of tested piles in place.

616.15 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing all materials and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work. The cost of preboring, filling of voids, splicing, and metal shoes or points shall be included in the price bid for the piles.

Loading tests will be paid for at the contract unit price for "Pile Loading Tests", or, in the absence of such a price bid, they will be paid for as extra work.

616.16 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
616003-*	CONCRETE PILES	Linear Foot (Meter)
616004-*	"size" STEEL BEARING PILES, DRIVEN	Linear Foot (Meter)
616005-*	STEEL BEARING PILES, PRE-DRILLED AND DRIVEN	Linear Foot (Meter)
616007-*	PILE LOADING TESTS	Per Pile
616016-*	SHEET PILING LEFT IN PLACE	Linear Foot (Meter)
616017-*	SHEET PILING, DRIVEN	Linear Foot (Meter)

* Sequence number

SECTION 625
DRILLED CAISSON FOUNDATIONS

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

625.1 - DESCRIPTION:

The work of this section includes the furnishing of all materials and the construction of foundations consisting of reinforced concrete caissons placed within drilled excavations. Each drilled caisson foundation shall consist of a shaft section, with the lower portion in a drilled rock socket and with the upper portion in a steel casing. This casing will normally be removed during concrete placement unless otherwise shown in the plans or directed by the Engineer.

625.2 - TESTS AND SUBMITTALS:

The Contractor shall deliver all submittals required by this specification to the Engineer no later than one month prior to constructing any drilled caissons shown in the plans. No drilled caissons shall be constructed prior to the Engineer's review and acceptance of all submittals and test hole results.

625.2.1 - Experience:

1) A satisfactory record of experience in drilled caisson construction is considered to be of the utmost importance in obtaining a satisfactory drilled caisson installation. The installation of the drilled caisson is required to be performed by a contractor or specialty subcontractor specializing in installing drilled caissons and having experience with caissons of similar length, diameter, and subsurface conditions as those shown in the contract documents.
2) The Contractor shall submit data on at least two projects performed during the past ten years, for which the Contractor (or the Subcontractor if applicable) has installed drilled caissons of a range of diameters and lengths similar to those shown in the plans, in similar quantities, and under similar subsurface conditions. The list of projects shall contain names and phone numbers of owners' representatives who can verify the participation in those projects.
3) The Engineer shall review and approve the Contractor’s (Subcontractor’s) caisson. If in the opinion of the Engineer the Contractor’s qualifications are not adequate, the Contractor shall submit to the Engineer a proposed method of obtaining the necessary qualifications.
4) The installation of all components of the drilled caisson including; drilling, reinforcement placement, concrete placement, and required wet hole condition work, casing installation and removal, slurry placement, and any other work required to complete the drilled caisson, shall be performed by the approved contractor or specialty subcontractor.

625.2.2 - Site Inspection: A signed statement shall be submitted affirming that the Contractor (or the Subcontractor if applicable) has inspected the project site and the available subsurface information including any available soil or rock samples.

625.2.3 - Installation Plan: The Contractor shall submit an Installation Plan for review by the Engineer. This plan shall provide information on the following:

a) Name and experience record of the drilled caisson superintendent in charge of drilled caisson operations for this project.

b) List of proposed equipment to be used on the project, including barges, cranes, templates, drill rigs, drills, augers, bailing buckets, final cleaning equipment, slurry desanding equipment, slurry pumps, core sampling equipment, welding equipment, tremie or concrete pumps, casing, etc.

c) Details of overall construction operation sequence and the sequence of caisson construction in the piers and/or the abutments; taking due care not to damage fresh concrete by drilling in the immediate vicinity too quickly.

d) Method for maintaining drilled caisson position and alignment during excavation, and details and sequencing of caisson excavation.

e) Details of casing and splices to be used, including calculations (signed and stamped by a Professional Engineer knowledgeable in drilled caissons) showing ability of casing to withstand anticipated hydraulic and earth pressures and to withstand stresses due to installation without undue deformation. Description for withdrawal of casings to demonstrate that concrete will not be lifted during withdrawal.

f) When the use of slurry is anticipated, details of the methods to mix, circulate, and desand slurry. Any request to use a slurry displacement method for the construction of caissons shall also provide information for the Engineer's approval as follows:

   1. Detailed description of proposed construction method.
   2. Concrete mix, as modified for use with the slurry displacement method.
   3. Components and proportions in proposed slurry mixture.
   4. Tests proving slurry mixture will not degrade rock or interfere with bond.
   5. Methods to agitate slurry mixture prior to concrete placement.
   6. Methods to clean slurry mixture for re-use.
   7. Disposal methods for used slurry.

g) Details of methods to mechanically clean the caisson excavation.

h) Details of reinforcing cage fabrication and placement including support of the reinforcing cage during handling, after installation, and during concrete placement, along with methods and devices that will be used to center the reinforcing cage and maintain concrete cover over the bars.

i) Details of concrete placement including proposed operational procedures for free-fall, tremie, pumping or other methods.

j) Sample of proposed drilled caisson report, proposed drilled caisson log, and proposed Preinstallation core hole log.

k) Welding procedures and qualifications of welders and tackers as specified in ANSI/AWS D1.1 for casing steel and in ANSI/AWS D1.4 for reinforcing steel.

l) Preinstallation Coring procedure.

m) Qualifications and experience record of firm proposed to perform Preinstallation Coring, including experience record of the supervisor designated to oversee the work.
n) Mix design for concrete and for non-shrink grout.
o) Plan to minimize vibration and wheel loads in the vicinity of newly placed caissons.
p) Plan for compliance with applicable environmental regulations, including but not limited to the protection of river water from degradation due to material excavated from drilled caisson locations or due to other harmful erosion, protection of the environment from slurry spillage or discharge if slurry is used, and general environmental protection of the area from all operations related to drilled caissons.
q) The Contractor's proposed Safety Plan per Section 625.5.2.7.

The Engineer will evaluate the Drilled Caisson Installation Plan for conformance with the Plans, and Specifications. Within 14 days after receipt of the plan, the Engineer will notify the Contractor in writing of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not result in any additional cost to the Division if they fail to perform also shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the Plans and Specifications.

625.2.4 - As-Built Records: Within 24 hours of the completed construction of each drilled caisson, the Contractor shall submit a report on the actual location, alignment, elevation, and dimensions of the drilled caisson, and will also submit a completed drilled caisson log as specified herein.

625.2.5 - Test Hole: A test hole shall be drilled at the location and to the diameter and depth shown in the plans. The test hole shall be unreinforced but shall otherwise be constructed the same as other drilled caissons in the plans. This shall include casing extraction if required by the project or the Contractor's proposed installation plan. CSL testing will not be required for the test hole, however the Contractor may, at his own expense perform CSL testing. The Contractor shall revise his methods and equipment as necessary during construction of the test hole when he is unable to carry out the requirements of the plans. Completed test holes shall be left in place except that the top of the caisson shall be removed to a depth of 2 ft (600 mm) below final ground line. Disturbed areas at the site of the test hole shall be restored to their original condition. If the Contractor fails to demonstrate the adequacy of his methods or equipment, the Engineer shall require additional test holes be provided at the Contractor's expense.

625.2.6 - Nondestructive Testing

625.2.6.1 - General Requirements: The nondestructive testing method known as Crosshole Sonic Logging (CSL) shall be used on any drilled caisson which is constructed with the placement of concrete underwater or as required in the plans. The testing shall not be conducted until at least twenty-four hours after

placement of concrete is concluded in the caisson, and will be completed within 14 calendar days after such placement.

The CSL tests shall be conducted by the Engineer with the cooperation of the Contractor. The Contractor shall provide suitable working space and access to every tested caisson and shall provide a reliable 1000-watt generator for use by the Engineer.

625.2.6.2 - Preparation for Testing: To accommodate the CSL test requirements, the Contractor shall install a number of tubes in each caisson to be tested. The number of tubes per caisson shall be as tabulated below:

TABLE 625.2.6.2

Caisson Diameter	Number of Tubes	Tube Spacing
Up to 42" (1 049 mm)	3	120º
42" to 60" (1 050 mm to 1 499 mm)	4	90º
60" to 96" (1 500 mm to 2 399 mm)	6	60º
96" (2 400 mm) and larger	8	45º

The tubes shall be per section 625.4.4. Each tube shall have a round, regular internal diameter free of defects or obstructions including defects or obstructions at pipe joints; in order to permit the free, unobstructed passage of 1½ inch (35 mm) diameter source and receiver probes. The tubes shall be watertight and free from corrosion with clean internal and external faces to ensure passage of the probes inside and a good bond with the concrete outside.

Each tube shall be fitted with a watertight shoe on the bottom and a removable cap or plug on the top. The tubes shall be securely attached to the interior of the reinforcing steel cage. The tubes are typically wire-tied to the reinforcing cage every 40 inches (1 000 mm), or otherwise secured such that the tubes stay in position during placement of the cage and during placement of concrete. The tubes shall be installed in each shaft in a regular, symmetric pattern such that the tube spacing in degrees will correspond to that shown in the table above.

The tubes shall be as near to parallel as possible. They shall extend from 6 inches (150 mm) above the caisson bottom to at least 40 inches (1 000 mm) above the caisson top. No tube may be allowed to rest on the bottom of a drilled excavation. If the caisson top is sub-surface, then the tubes shall extend at least 2 ft (600 mm) above the ground surface or above the water surface if the ground surface is below water. Any joints required to achieve full length tubes shall be made watertight. Care shall be taken during placement of the reinforcing steel cage so as not to damage the tubes.

After placement of the cage, and before placement of concrete, the tubes shall be filled with clean water and the tube tops shall be capped or sealed to keep debris or other foreign matter out of the tubes. Care shall be exercised in the removal of caps

or plugs so as not to apply excess torque, hammering, or other stresses that could break the bond between the tubes and the concrete.

625.2.6.3 - CSL Logging Procedures: Before placement of concrete, the Contractor shall investigate at least one tube per shaft. This investigation is to make sure that there are no bends, crimps, obstructions or other impediments to the free passage of the testing probes. A record of the tube length or lengths, including a note of the projection of the tubes above the top of the shaft shall be made. The Contractor shall provide information on the shaft bottom and top elevations, length and construction dates to the Engineer prior to the CSL tests.

The Contractor shall make the caisson and the caisson site available to the Engineer for the conduct of the CSL tests. Any defects indicated by tests shall be evaluated by the Engineer and further tests may be conducted in regard to the extent of such defects. Any time required by such tests will be considered incidental to the work and will not be cause for extra compensation related to a claim or extension of contract.

625.2.6.4 - CSL Testing Results: The CSL test results will be compiled into a caisson integrity testing report for each caisson. The report will summarize and analyze any defect zones indicated on the logs. A copy of each report will be provided to the Contractor.

625.2.6.5 - Evaluation of CSL Test Results: The Engineer will evaluate the CSL test results and will determine whether or not the drilled caisson as constructed is acceptable. If the Engineer determines that the drilled caisson is acceptable based on the CSL tests, then the caisson and the caisson site will be turned back to the Contractor and further construction may proceed.

The acceptance of each drilled caisson shall be the decision of the Engineer, based on the results of the caisson integrity testing report and other information on the caisson placement. Rejection of a caisson shall require conclusive evidence that a defect exists in the caisson, which will result in inadequate or unsafe performance under service loads. If the Non Destructive Testing records are complex or inconclusive, the Engineer may require the Contractor to verify caisson conditions, in accordance with 625.2.6.6. If a defect is confirmed, the Contractor shall pay for all coring and grouting costs. If no defect is encountered, compensation for all coring and grouting will be in accordance with 104.3 and 109.4 of the Standard Specifications.

In the case that any caisson is determined to be unacceptable, the Contractor shall submit a plan for remedial action to the Engineer for approval. Any modifications to the foundation caisson and load transfer mechanisms caused by the remedial action will require calculations and working drawings stamped by a professional engineer registered in the State of West Virginia for all foundation elements affected. All labor and materials required to perform remedial caisson action shall be provided at no cost to the Division and with no extension of the contract time.

625.2.6.6 - Evaluation by Core Drilling: A drilled caisson that is found to be unacceptable shall be cored by the Contractor using double tube core barrels. One or more core holes shall be drilled at the location(s) as determined by the Engineer. A core sample shall be taken from each defect location, at a length specified by the Engineer. An accurate log of the core shall be kept and the core shall be crated and properly marked showing the caisson depth at each interval of core recovery. The core along with five copies of the coring log shall be provided to the Engineer.

If the quality of the caisson, as represented by the core samples, is determined to be acceptable, then the caisson and the caisson site will be turned back to the Contractor and further construction may proceed. If the quality of the caisson is determined to be unacceptable, then the Contractor shall proceed in accordance with 625.2.6.5.

625.3 - DIMENSIONAL REQUIREMENTS:

The dimensional requirements for Placement Tolerances and Caisson Diameters shall be met prior to placement of reinforcing steel. The Contractor shall submit his corrective plan for any deviation from the caisson location, alignment and elevation tolerances, and reinforcement dimensional requirements to the Engineer for approval. The cost of any corrective action shall be borne by the Contractor.

625.3.1 - Placement Tolerances: For any drilled caisson the maximum permissible deviation from plumb shall be 2% or a ratio of 2:100 with respect to a truly vertical axis. For any drilled caisson at its top, the maximum deviation of the center shall be 3 inches (75 mm) from its project plan location.

625.3.2 - Caisson Diameters: Rock sockets shall be of a minimum diameter equal to the caisson diameter shown in the plans. Casings, extending upward from the rock surface, shall have a minimum inside diameter equal to the caisson diameter shown in the plans, but may be larger in diameter to expedite the Contractor's operations.

625.3.3 - Bottom Excavation: Excavation equipment and methods shall provide the completed caisson excavation with a flat bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of plus or minus 1¼ inches per 40 inches (30 mm per 1 000 mm) of diameter.

625.3.4 - Caisson Cutoff Elevations: For any drilled caisson the maximum permissible deviation from finished top of shaft elevation shall be minus 3 inch (75 mm) and plus 1 inch (25 mm).

625.3.5 - Reinforcement: After all concrete has been placed, the top of the reinforcing steel cage shall be no more than 4 inches (100 mm) above, and no more than 2 inches (50 mm) below, the plan elevation. An absolute minimum clearance of 3 inches (75 mm) to the reinforcing steel is strictly required.

625.4 - MATERIALS:

625.4.1 - Concrete: Concrete for the drilled caissons shall be Class "B" (modified) and shall conform to the requirements of Section 601 of the Standard Specifications.

The design 28-day compressive strength shall be not less than 4500 psi (31 Mpa) unless shown otherwise in the plans. The Contractor will prepare a mix design to attain this strength, retaining the basic characteristics of Class "B" concrete. Slump for dry placement will be 7 inches (175 mm) plus-or-minus 1 inch (25 mm). Unless otherwise specified in the plans, the cement shall be Type I.

For placement of caisson concrete by tremie or pumping, the cement content shall be increased by one bag from the original design cement content, the slump shall be 8 inches (200 mm) plus-or-minus 1 inch (25 mm) and shall maintain a slump in excess of 4 inches (100 mm) throughout the concrete placement, and the maximum aggregate size shall be 1 inch (25 mm). The maximum amount of cement in the mix shall not exceed 8 ½ bags.

625.4.2 - Reinforcing Steel: Reinforcing steel for main vertical bars and ties shall conform to Section 709.1, deformed type, grade 60 (400). Reinforcing steel for use as spirals shall conform to Section 709.1, plain type, grade 60 (400).

625.4.3 - Casing: Metal casing shall be used whenever required to prevent caving of the soil material or to exclude ground water. Casing shall be metal, of unit or sectional construction, be strong enough to withstand handling stresses, withstand the pressures of concrete and of the surrounding earth and ground water, and prevent seepage of water. Also, the casing used shall be selected by the Contractor to control dimensions and alignment of excavations within tolerances, to seal the casing into impervious materials, and to execute all other construction operations.

Casing pipe shall conform to ASTM A 252/A 252M, Grade 2, for either temporary or permanent application. Any required casing splices shall be welded in accordance with Section 625.2.3 e) of this specification with no interior splice plates, producing true and straight casing. All welding shall be in accordance with ANSI/AWS D1.1.

Permanent casing is required in all caissons where noted on the plans. All temporary casing shall be removed during placement of concrete unless otherwise noted on the plans. Should the Contractor be unable to remove the temporary casing, the Contractor shall pressure grout the annular space between the casing and soil. Materials and methods for grouting operation shall be submitted to the Engineer for approval for the grouting operation at no additional cost to the Division.

625.4.4 - CSL Testing Tubes: Tubes required for CSL Tests shall be ASTM A53, Grade B, nominal 2 inch (50 mm) diameter. Hydrostatic test requirements are waived. Threaded Couplings shall be used per ASTM A 865.

625.5 - CONSTRUCTION:

625.5.1 - General: The following sequence describes a generalized construction method that is expected to be appropriate for the installation of the drilled caissons. Deviations will be permitted with the Engineer's approval.

a) Excavate to top of shaft elevation.

b) Drilling of a "Preinstallation Core Hole" prior to drilling of caisson hole. The drilling and sampling of the preinstallation core holes shall be done by use of double tube core barrels. Additional preinstallation core holes in other locations may be required where directed by the Engineer. Such additional core holes shall be paid for at the contract unit bid price. The preinstallation core hole will be drilled from the ground surface, downward a distance equal to the caisson diameter below the expected bottom of rock socket. Its purpose is to assure that the rock just below the socket is sound and able to carry the loads that will be imposed on it.

   A preinstallation core hole is a 2 inches (50 mm) nominal diameter hole, with coring, where the quality of the rock core and the rate of drilling are used to determine if there is satisfactory rock of sufficient type and thickness, and to locate the presence of open joints, voids, soft rock or other deleterious material. Logs of the core hole shall be provided to the Engineer within 24 hours of completion of coring. All cores shall be maintained by the Contractor until completion of the project and shall then become the property of the Engineer.

c) Drilling of cased hole through the soil overburden down to top of competent rock. Seating bottom of casing to minimize entry of ground water.

d) Drilling of rock socket to the minimum diameter shown in the plans and to a depth shown on the drawings or otherwise directed by the Engineer.

e) Cleaning of the drilled hole, particularly the rock socket and the inside face of the casing; inspection of the hole and approval for placement of the caisson material.

f) Placement of the pre-assembled cage of reinforcing steel and securing it in place against movement during concreting and during casing withdrawal. It also must be secured in such a way that the minimum clear cover over the bars is maintained. Placement of tubes as required for CSL testing.

g) Placement of concrete in either dry or wet conditions. In the case of dry conditions, concrete placement shall be by the free-fall method with the concrete carefully directed down the center of the caisson without striking the casing, the reinforcing steel, the CSL tubes or the sides of the rock socket. In the case of wet conditions, concrete placement shall be by tremie or pumping with the mix adjusted accordingly. If the temporary casing is to be removed it shall be withdrawn carefully and slowly so as not to leave any voids in the concrete and so as not to dislocate any reinforcing steel. Any concrete not meeting this specification's slump requirements shall be rejected.

h) For any parts of any caisson that extend above either the existing or permanent grade, that portion shall be placed by use of forms of the

diameters shown in the plans. Curing, stripping, and finishing shall be the same as for other structural concrete. Casing may be used as forms.

i) Turning the site over to the Engineer for CSL testing if required. Cooperation with the Engineer in the conduct of the testing, as specified herein. Corrective measures for any unacceptable caissons. Removal of water from the CSL tubes and filling with an approved grout. All core holes must be filled with an approved grout.

625.5.2 - Excavation:

625.5.2.1 - Scope: The Contractor shall drill one preinstallation core hole at each caisson location unless otherwise noted on the plans. The Contractor shall perform all excavations required for the caissons and the rock sockets, through whatever materials are encountered, to the dimensions shown in the plans, or required by the site conditions, or directed by the Engineer. The Contractor shall make each caisson excavation available to the Engineer for inspection, providing tools, equipment, and safety measures as hereinafter specified. Based on preinstallation core hole information or on general inspection of the rock socket, the Contractor shall drill the rock socket deeper if directed by the Engineer.

625.5.2.2 - Excavation through Overburden: Unless otherwise shown in the plans, drilled caisson excavations in the overburden shall be vertical bored holes extending from the ground surface down to the surface of competent rock. Temporary or permanent casings may be required down to the competent rock surface and shall be seated in rock in a manner that prevents caving and minimizes the entry of ground water. In the event of a groundwater condition, appropriate measures shall be taken subject to the Engineer's approval. Such measures may include pumping from within the excavation, external dewatering, or excavation through a slurry-filled hole until the casing can be seated and sealed. In cases in which the water is difficult to control, the Engineer may permit wet excavation which could require later inspection by diving methods and would require later placement of concrete by underwater methods.

625.5.2.3 - Excavation in Rock: Rock sockets shall be excavated to the dimensions and depths shown in the plans, forming a flat bearing area at the bottom of the socket. Each socket shall be excavated into continuous rock for the indicated length, by use of methods subject to the Engineer's approval. Blasting methods will not be permitted.

Upon completion of each rock socket excavation, the Engineer may (1) accept the socket, or (2) order deeper excavation based upon preinstallation core hole data or general inspection of the socket. The adequacy of each socket will depend on the soundness of its bottom surface and on the soundness of its underlying layers. The Contractor shall drill required preinstallation core holes as directed and shall excavate sockets to the depth directed by the Engineer.

Contractor is cautioned not to over-drill the rock sockets. Unauthorized over-drilling will be at the Contractor’s expense. In the case where over-drilling would bring the caisson base too close to a coal seam or other weak layer, then drilling

must be extended through such weak layer, at the Contractor's expense, to a satisfactory deeper bearing level as determined by the Engineer.

No portion of the rock socket shall be exposed to drilling fluid or groundwater for more than 96 hours. Any portion of the rock socket exposed to drilling fluid or water for more than 96 hours, and any portion of the rock socket which, in the opinion of the Engineer, has deteriorated due to exposure to air or water, shall be reamed with an approved grooving tool to a depth of not less than ¼ inch (6 mm), or as directed by the Engineer. Reaming of the socket, if necessary, is considered incidental to the cost of drilling the rock socket, and no separate payment will be made for this work.

625.5.2.4 - Providing for Socket Inspection: Upon completion of the excavation of each rock socket, and upon mechanical cleaning of the socket, the Contractor shall make the socket available to the Engineer for inspection. The Contractor shall provide suitable access for inspection, electric lighting, devices for checking dimensions, alignment and plumbness, ventilation equipment, the protective cage, radio communication, and auxiliary safety line. The air in the caisson shall be tested for noxious and/or explosive gases prior to and during entry of inspection personnel, to assure a safe working environment.

625.5.2.5 - Disposal of Materials: Disposal of excavated materials shall be accomplished under the general provisions of Section 207.6 of the Standard Specifications.

625.5.2.6 - River Area: Drilled caisson construction in the river shall employ whatever special methods the Contractor finds necessary for access and for accomplishing the work. These methods may include cofferdams, temporary sand islands, or other suitable measures. The Contractor will be responsible for conforming to all regulatory and environmental requirements related to the river and for obtaining any permits that are required by his river operations.

625.5.2.7 - Safety Measures: Safety of all persons is to be considered an objective of the utmost importance on this project. Therefore, the Contractor will take whatever measures are necessary to protect his own personnel, his subcontractors' personnel, the Engineer or other agents of the state, regulatory personnel, and others including the general public. The following list is presented as representative of issues that the Contractor must address. It is not intended as all-inclusive and does not relieve the Contractor of conforming to other regulations, laws, requirements, or other measures reasonably required for safe excavating operations. The Contractor shall develop a safety plan in accordance with these requirements and provide this plan to the Engineer for his review.

a) Any required equipment within an excavation shall be operated by air or electricity. The use of gasoline-driven engines or diesel engines within an excavation will not be permitted. All lighting shall be electric and precautions shall be taken in regard to potential short circuits of electric current within ground water.

b) The Contractor will take precautions to assure that no explosive or noxious gases are present. Fresh air shall be supplied into the excavation and foul air shall be removed whenever any personnel are present in the hole.

c) A safety harness or chair lift, with separate safety line, protective cage, and two-way radio communication shall be used for any entry into an excavation.

d) No open excavation shall be left unattended. During non-working hours excavations shall be protected by the use of solid, safe covers that are firmly fastened in place.

625.5.3 - Reinforcing Steel Installation: Prior to installation of reinforcing steel, the steel cage shall be checked and cleaned of any materials that would tend to prevent bonding. The excavated hole shall also be checked and any remaining or newly deposited debris shall be removed. Immediately upon the Engineer's approval of the condition of the cage and his acceptance of the socket, and just prior to placement of concrete, the fully assembled cage of reinforcing steel shall be installed into the excavation.

The cage will consist of longitudinal (vertical) bars, spiral or tie bars, cage stiffener bars as required, spacing devices, and any other appurtenances required to maintain alignment, shape, and clearances. Cages shall include steel tubes in shafts where CSL testing is to occur. Each cage shall be placed in one unit by lowering into the hole in a manner that will prevent distortion. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals (near the bottom and at intervals not exceeding 10 ft (3 000 mm) along the caisson) to ensure concentric spacing for the entire cage length. The minimum number of centering devices at each level shall be three. All steel centering devices with less than 3 inches (75 mm) of concrete cover shall be epoxy coated. The cage shall be supported from the top by use of a ground surface frame or other positive means. Setting the cage on the socket bottom without support will not be permitted. The Contractor may with the approval of the Engineer, remove the top support after sufficient concrete has been placed to adequately support the cage vertically and prevent distortion or racking of the cage.

The bottom of the reinforcing steel cage shall be a minimum of 3 inches (75 mm) and a maximum of 24 inches (600 mm) from the bottom to the drilled caisson excavation. Additional clearance may be approved by the engineer.

All intersections of drilled caisson reinforcing steel shall be tied with cross or “figure 8” ties. The reinforcing steel in the caisson shall be 100% tied and supported so that the reinforcing steel will remain within allowable tolerances for position. Unless otherwise shown in the plans, splicing shall be by mechanical connectors or couplers which develop at least 125% of yield strength of the reinforcing bar. No more than 50% of the longitudinal reinforcing shall be spliced within 60 bar diameters of any lapped splice location or within 2 ft (600 mm) of any mechanical splice or coupler location. Cage stiffener bars shall be used as required to provide a reinforcement cage of sufficient rigidity to prevent racking, permanent deformations, etc. during installation. If the concrete is to be placed by the free-fall method, these bars must first be removed.

In the event that the caisson has been excavated below the anticipated tip elevation, the reinforcing cage may be extended at the tip (low) end by lap splices, mechanical connectors, or welded splices in conformance with the Standard Specifications. In this instance, splices need not be staggered and 100% of the reinforcing bars may be spliced at a given location. Lap splice lengths shall be as shown in the plans or approved by the Engineer.

Prior to placing the reinforcement cage, the Contractor shall demonstrate to the satisfaction of the Engineer that the fabrication and handling methods to be used will result in a reinforcing cage placed in the proper position, with the proper clearances, and without permanent bending or racking of the reinforcement cage.

The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, corrections shall be made by the Contractor to the satisfaction of the Engineer. No additional caissons shall be constructed until the Contractor has modified his rebar cage support system in a manner satisfactory to the Engineer.

625.5.4 - Placement of Concrete: Prior to concrete placement, the Contractor shall make all necessary arrangements to assure the uninterrupted delivery of concrete so that there will not be any cold joints in the caissons. Placement of concrete shall generally conform to the applicable portions of Section 601.10 of the Standard Specifications. The rate of placement of concrete, as related to the height of fresh concrete at any time, will be subject to the Engineer's approval. The placement method will be developed by the Contractor, taking account of set time, hydraulic pressures and casing removal.

The placement of concrete in dry conditions shall be by a free-fall method. The height of free fall is not limited, but segregation of the concrete is not permitted. In order to qualify as a dry condition the caisson excavation must meet two requirements. The first requirement is the infiltration rate shall not exceed ¼ inch (6 mm) of depth per minute as measured in the bottom 18 inches (450 mm) of the rock socket. The second requirement is that at the time of concrete placement the depth of water in the bottom of the rock socket shall not exceed 2 inches (50 mm). The dry concrete placement method may be used only when the sides and the bottom of the caisson excavation remain stable without detrimental caving, sloughing or swelling, and water can be satisfactorily removed prior to inspection and prior to placing concrete.

In a case where the Engineer determines that dry conditions cannot be attained, he will require placement by the wet placement method shown in the approved Installation Plan. The casing shall be filled with clean water to an elevation not less than 4 feet (1 200 mm) above the water elevation outside the casing, to provide a positive water pressure inside the casing. Concrete will then be placed by conventional tremie or pumping methods. Tremie or pump placement methods shall not utilize aluminum parts which would be in contact with the concrete.

Tremies used to place concrete shall consist of a tube of sufficient length, weight, and diameter to discharge concrete at the caisson base elevation. The tremie inside diameter shall not be less than 10 inches (250 mm). The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and

unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends which restrict concrete placement.

The tremie used for concrete placement shall be watertight. Concrete placement shall not begin until the tremie is placed at the caisson base elevation. Valves, bottom plates, or plugs may be used only if concrete discharge starts within approximately 2 inches (50 mm) above the excavation bottom. Plugs shall either be removed from the excavation or be of a material approved by the Engineer which will not cause defects in the caisson if not removed.

The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall remain at or near the bottom of excavation as long as practicable during concrete placement. The tremie discharge end shall remain immersed as deep as practicable in the concrete, consistent with the Contractor's construction methods, and shall be immersed at least 10 ft (3 000 mm) in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The concrete in the tremie shall be maintained at a positive pressure differential at all times to prevent water or slurry intrusion into the caisson concrete.

All pump lines shall have a minimum diameter of 4 inches (100 mm) and shall be constructed with watertight joints. Concrete placement shall not begin until the pump line discharge orifice is at the caisson base elevation. A plug or similar device shall be used to separate the concrete from the fluid in the hole until pumping begins. The plug shall either be removed from the excavation or be of a material approved by the Engineer which will not cause a defect in the caisson if the plug is not removed. The discharge orifice shall remain at least 10 ft (3000 mm) below the surface of the fluid concrete.

If at any time during the concrete pour, the tremie line orifice or the pump line orifice is removed from the fluid concrete column and discharges concrete above the rising concrete level, the entire drilled caisson shall be considered defective. In such case, the Contractor shall remove the reinforcing cage and concrete, complete any necessary sidewall removal directed by the Engineer and repour the caisson. All costs of replacement of defective caissons shall be the responsibility of the Contractor and shall be at no cost to the Department.

After the concrete level has reached the required top elevation, it will be forced to overflow in the case of tremie or pump placement, leaving only fresh, uncontaminated concrete. In the case of placement by free fall (dry conditions), the concrete will be continued high enough to compensate for any settlement due to removal of casing.

The top 10 ft (3 000 mm) of each drilled caisson shall be vibrated except, when more than 10 ft (3 000 mm) is to be exposed above the ground line or the riverbed, then the entire exposed portion shall be vibrated. Exposed portions of each drilled caisson shall be cured in accordance with Section 601.12 of the Standard Specifications.

625.5.5 - Removal of Casing: Removal of the casing from a shaft may occur gradually as concrete is placed. In all cases, extraction of casing shall begin within one hour from the beginning of concrete placement in the cased portion of the

shaft. Insofar as possible, casing extraction shall be done at a slow uniform rate by application of a steady vertical upward pull in the direction of the axis of the shaft. To facilitate extraction, tapping on the casing, exertion of temporary downward pressure, slight rotation, or the controlled use of a vibratory hammer will be permitted, but care must be taken to avoid harmful impacts or disturbances to the fresh concrete. Vibration or rodding may not be used to break the casing loose for extraction.

If, during extraction of casing, upward movement of concrete and/or reinforcing steel occurs, the Engineer shall be notified immediately. If he considers the movement to be minor, he may permit the extraction of the casing to continue. If, however, the movement is deemed significant and indicative of squeezing of the surrounding soil thus resulting in a reduction of the caisson diameter, then he may order the casing to be left in place, or he may permit extraction to proceed and order a later non-destructive load test, or may order other procedures as appropriate at no additional cost to the Division.

For the upper portions of drilled caissons that will be exposed and visible, the casing may remain in place as a form until the concrete has attained a strength that enables it to stand alone without further deformation. Casing shall then be removed.

625.6 - INSPECTION OF SOCKETS:

625.6.1 - Depth of Rock Socket: Each rock socket shall be drilled to the shaft diameter shown in the plans unless otherwise directed by the Engineer based on subsurface conditions encountered.

The top elevation of competent rock must be confirmed as the socket drilling is started. The effective "top elevation" is based on observation of the boundary zone where broken or weathered rock becomes competent rock, and is also influenced by the presence of any shale or coal seams. Based on that elevation, and the information from the preinstallation core hole, the Engineer will determine the final depth of socket and bottom elevation. The drilled rock socket will then be inspected per 625.5.2.3 and will either be accepted or drilled deeper as determined by the Engineer.

625.6.2 - Inspection Under Water: In a case where it is considered unfeasible to dewater a caisson, the Contractor shall provide drilled caisson logs and screenings to the Engineer for evaluation. If this material is not sufficient for a proper judgment, the Engineer will reserve the right to order an inspection by diving or other methods either through a separate specialty subcontractor or through the Contractor in which case compensation would be under Sections 104.3 and 109.4 of the Standard Specifications. Any time required for inspection under water will be considered incidental to the work and will not be cause for extra compensation related to a claim or extension of contract time.

625.7 - METHOD OF MEASUREMENT:

Drilled caissons and Rock Socket foundations will be measured by the linear foot (meter). Drilled Caissons are the portion from the finished top of each caisson to

the top of competent rock. Rock Socket is the portion from the top of competent rock to the bottom of the caisson as shown in the plans or as directed by the Engineer. Each measured caisson is to be complete in place, accepted, and ready to function. "Top of caisson" is the top of concrete as shown in the plans. "Top of competent rock" is as tabulated in the drilled shaft schedules in the plans unless a difference of one 1 foot (300 mm) or more is found during drilling.

Drilled Caisson test hole will be measured in Lump Sum basis.

Preinstallation core hole shall be measured by the linear foot (meter) based upon actual length drilled. The plan quantity shall be based on one core hole, per drilled caisson, measured from the top shaft elevation to one caisson diameter below the bottom of rock socket unless otherwise noted in the plans. No payment shall be made for additional length of Preinstallation core hole drilled above the top of the drilled caisson.

625.8 - BASIS OF PAYMENT:

The accepted quantities of drilled caisson foundations, measured as provided above, will be paid for at the contract unit price per linear foot (meter); complete in place including excavation, slurry if required, temporary or permanent metal casing, steel reinforcing, concrete, curing, and any required forming and finishing. No additional payment will be made for temporary casing that remains in place and pressure grouting due to the Contractor's inability to stabilize a drilled excavation, for the need to place concrete by tremie or pumping, for the need to use slurry for drilling, or for extra excavation and concrete that may be required due to drilling diameters larger than the minimum diameters specified. No additional payment will be made for methods employed to gain access to drilled caisson construction or for means required to provide a dry working environment within the drilled caissons. Tubes for CSL testing, other responsibilities related to testing and inspection assistance are incidental, with no separate payment being made.

Drilled caisson test holes will be paid for at the contract lump sum price for each such hole.

Preinstallation core hole will be paid for by the linear foot (meter).

625.9 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
625001-*	Drilled Caissons “D” Diameter	Linear Foot (Meter)
625003-*	“D” Rock Socket Foundation Linear	Linear Foot (Meter)
625004-*	“D” Drilled Caisson Test Hole	Lump Sum
625005-*	Preinstallation Core Hole	Linear Foot (Meter)

* Sequence number

D = Diameter of drilled caisson, in inches (millimeters)

SECTION 626
RETAINING WALL SYSTEMS

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

626.1 - DESCRIPTION:

This work shall consist of furnishing the design, wall construction plans, materials, and construction of cast-in-place reinforced concrete or Mechanically Stabilized Earth (MSE) walls in accordance with these specifications and in reasonably close conformity with the lines, grades, design, and dimensions shown in the plans.

626.2 - GENERAL:

Unless specified otherwise in the contract documents the wall may be, at the Contractor's option, any one of the wall systems on the approved vendor list corresponding to the applicable pay Item. The approved Vendor Lists are available through the Materials Control Soils and Testing Division.

The Contractor shall indicate which wall system is to be constructed by the bid alternative chosen in the proposal. No change of the wall system indicated in the bid proposal shall be permitted after the bid opening unless approved by the Engineer.

The wall design and detail plans for construction shall be submitted to the Engineer for approval. The time required for preparation and review of these submittals shall be charged to the allowable contract time. Delays caused by untimely submittals or insufficient data will not be considered justification for time extensions. No additional compensation will be made for any additional material, equipment, or other items found necessary to comply with the project specifications as a result of the Engineer's review. The proposed wall design shall be compatible with the Contractor's proposed method of construction, and shall be compatible with any method of construction shown in the plans. The Division does not assume nor warrant any wall system's compatibility with any particular construction methods.

626.3 - DESIGN CRITERIA:

626.3.1 - General: The size of all structural elements shall be determined such that the design load stresses do not exceed the allowable stresses found in the AASHTO LRFD Bridge Design Specifications, latest edition.

Analysis of external stability of the in-place retaining wall system will be the responsibility of the Division. Any staged or temporary construction affecting wall stability shall be the responsibility of the Contractor.

The parapets on any portion of the retaining walls as shown in the plans shall be designed to resist traffic loads in accordance with the AASHTO LRFD Bridge Design Specifications, latest edition.

626.3.2 - Mechanically Stabilized Earth: The design for the MSE wall shall consider the internal stability of the wall mass. The design shall conform to the requirements found in AASHTO LRFD Bridge Design Specifications, latest edition.

External loads, which affect the internal stability such as those, applied through piling, bridge footings, temporary construction, etc. shall be accounted for in the design. A design life of 100 years shall be used throughout the design. The factor of safety for pullout resistance shall not be less than 1.50 based on pullout resistance at ¾ inch (19 mm) deflection.

The allowable bearing pressure under the stabilized mass shall be as shown in the plans. The minimum length of the soil reinforcing system, as measured from the back of the wall face to the end at the back of the soil stabilized mass, shall be as shown in plans, and shall be the same from top to bottom of the wall at any cross section.

All appurtenances behind, in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, or other items shown in the plans must be accounted for in the design of the wall.

626.3.3 - Cast-in-Place Reinforced Concrete: When a Cast-in-Place Reinforced Concrete option is included in the plans the following shall be applicable.

The information shown in the plans for the cast-in-place alternative is schematic; however, all dimensions shown in the plans shall be considered minimums.

The allowable bearing pressure of the foundation soils, the unit weight of the retained soils, and the characteristics of the retained soils necessary for design purposes shall be as shown in the plans.

626.4 - SUBMITTALS:

626.4.1 - General: The Contractor shall submit complete design calculations, explanatory notes, and detail plans for the proposed wall system. The detail plans shall include all details, dimensions, quantities, and cross sections necessary to construct the wall and shall include but not be limited to the following items:

A plan and elevation sheet or sheets for the wall which shall contain the following:

1. An elevation view of the wall which shall indicate the elevations at the top of the wall at all horizontal and vertical break points and at least every 50 ft. (15 m) along the face of the wall, all steps in the footings or leveling pads, the original and final ground lines, the maximum bearing pressures, and the summary of quantities for each wall.
2. A plan view of the wall which shall indicate the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment and the centerline of any drainage structure or drainage pipe behind, passing through, or under the wall.

3. A typical cross section or cross sections showing elevation relationship between existing ground conditions and proposed grades.
4. All general notes required for constructing the wall. The required batter to compensate for the wall movement during erection shall be shown for each different required height.
5. All horizontal and vertical curve data affecting the wall.
6. All details for footings or leveling pads shall be shown including details for steps in the footings or leveling pads.
7. All details for construction of walls with appurtenances behind, under, mounted upon, or passing through the wall such as drainage structures or utilities shall be clearly indicated.
8. The wall manufacture shall submit copies of their Quality Assurance/Quality Control Manuals on each project.
9. Required architectural treatments shall be as indicated and as detailed in the plans. All details for any required architectural treatments shall be shown including:
    a. Product data and installation instructions for manufactured form systems, form liners, release agents, ties, and accessories. The release agent manufacturer shall certify that the products supplied comply with regulations controlling the use of volatile organic compounds (VOC's).
    b. Shop drawings for fabrication and erection. These drawings shall show all items that visually affect the exposed concrete, including, but not limited to, general form construction, jointing, specially formed joints or reveals, and patterns of placement. The Engineer's review will be for general architectural applications and features only. Formwork design for structural stability and sufficiency is the Contractor's responsibility and shall not be submitted for the Engineer's review.
    c. Mockup or Sample Facing elements. The Contractor shall construct a mockup or sample facing element using the proposed formwork and facing materials in order to demonstrate the required finishes and textures. Actual construction of concrete shall not proceed until the Engineer has accepted the sample units.

At the time the detail plans are submitted for review, they shall be accompanied by design calculations and explanatory wall notes. These documents shall be legible and shall demonstrate that the design criteria have been met. Specified minimum factors of safety and the maximum soil pressure beneath the wall footing or earth stabilized mass shall be clearly indicated.

The plans shall be prepared on reproducible sheets 22 x 34 inches (550 mm x 850 mm) including borders. Each sheet shall have a title block in the lower right hand corner. The title block shall include the sheet number of the drawing, name or designation of the wall, the state and federal project designation, project name, fabricator and Contractor name. Design calculations and notes shall be prepared on sheets 8½ x 11 inches (216 mm x 280 mm), and shall contain the project designation, wall designation, date of preparation, initials of designer and checker, and page number at the top of the page. The Detail Plans, Design Calculations, and Explanatory Notes shall be signed and stamped by a Professional Engineer registered in West Virginia and knowledgeable in the proposed alternative wall system.

The initial submission shall include three sets of the detail plans, calculations, and notes. One set of notes and plans will be returned to the Contractor with any indicated corrections. When the plans and notes are stamped approved by the Engineer, the Contractor shall furnish the Engineer with the requested number of sets of prints and a Mylar set of the plans for distribution by the Division. The Contractor shall perform no work or ordering of materials for the structures until the Engineer has approved the submittal.

626.4.2 - Mechanically Stabilized Earth: The details and material specifications for the wall facing elements and incidental accessories shall be included with the detail plans for approval by the Engineer.

The designation as to the type of facing element, the length of the soil reinforcing systems, the distance along the face of the wall where changes in lengths of the soil reinforcing systems occur, and the limit of mesh, strip, or anchor shall be clearly shown in the plans.

All wall facing elements shall be detailed. The details shall show all dimensions necessary to construct the element, all reinforcing steel in the element, and the location of soil reinforcing system attachment devices embedded in the elements.

626.4.3 - Cast-in-Place Reinforced Concrete: The plans for the cast-in-place wall shall contain a complete reinforcing bar schedule showing all bending details and bar marks. The plans shall also show the location of all construction joints, expansion joints, or other joints in the wall. All wall thickness shall be shown and transition details at wall thickness changes.

626.5 - MATERIALS:

626.5.1 - Mechanically Stabilized Earth Components: The Contractor shall make arrangements to purchase the facing elements, reinforcing mesh or strips, attachment devices, joint materials, and all other necessary components. Materials not conforming to this section of the specifications or from sources not listed in the contract documents shall not be used without written consent from the Engineer.

626.5.1.1 – Facing Elements:

626.5.1.1.1 – Reinforced Concrete Facing Elements: The facing elements shall be fabricated in accordance with Section 601 of the Standard Specifications with the following exceptions and additions:

A. Concrete for the reinforced concrete facing elements shall attain a minimum compressive strength of 4,000 psi (27 Mpa) at 28 days. All concrete shall have air entrainment of 7 % plus or minus 2.5 % with no other additives. Specified concrete properties are to be tested in accordance with applicable provision of Section 601.4.1 of the Standard Specifications. Acceptance of a Production LOT will be made if the compressive strength test result is

greater than or equal to, 4,000 psi (27 Mpa). A Production LOT is defined as a group of elements that will be represented by a single compressive strength sample and will consist of a single day's production. A minimum of two cylinders shall be required for every compressive strength sample.

B. The units shall be fully supported until the concrete reaches a minimum compressive strength of 1,000 psi (7 Mpa).
C. Unless otherwise indicated in the plans or elsewhere in the specifications, the concrete surface for the front face shall have a Class 1 finish as defined by Section 601.11 and a uniform surface finish for the rear face. The rear face of the element shall be screeded to eliminate open pockets of aggregate and surface distortions in excess of ¼ inch (6 mm). The elements shall be cast on a flat area. The clevis loops, tie strip guide, or other galvanized devices shall not contact or be attached to the face element reinforcement steel.
D. The date of manufacture, the Production LOT number, and the piece mark shall be clearly scribed on an unexposed face of each element.
E. All units shall be handled, stored, and shipped in such a manner as to eliminate the dangers of chipping, discoloration, cracks, fractures, and excessive bending stresses. Elements in storage shall be supported in firm blocking to protect the element connection devices and the exposed exterior finish.
F. All units shall be manufactured within the following tolerances:
    1. Element Dimensions: Position of element connection devices within 1 inch (25 mm), except for coil and loop embeds which shall be 3/16 inch (5 mm). All other dimensions within 3/16 inch (5 mm).
    2. Element Squareness: Squareness as determined by the difference between the two diagonals shall not exceed ½ inch (13 mm).
    3. Element Surface Finish: Surface defects on smooth formed surfaces measured over a length of 5 feet (1.5 m) shall not exceed ¼ inch (6 mm). Surface defects on the textured-finished surfaces measured over a length of 5 feet shall not exceed 5/16 inch (8 mm).

Units shall be rejected because of failure to meet any of the requirements specified above. In addition, any or all of the following defects shall be sufficient cause for rejection:

1. Defects that indicate imperfect molding.
2. Defects indicating honeycombed or open textured concrete.
3. Cracked or severely chipped elements.
4. Color variation on front face of element due to excess form oil or other reasons.

All reinforcing steel shall be in accordance with Section 602 of the Standard Specifications and shall be epoxy coated.

626.5.1.1.2 – Modular Block Facings: The length and width of each block shall be within ±1/8 inch (3.2 mm). The height of each block shall be within ±1/16 inch (1.6 mm). Hollow units shall have a minimum wall thickness of 1.25 inch (32 mm). When a broken face finish is used the dimension of the front face shall be within 1 inch (25 mm) of the theoretical dimension of the unit.

All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or performance of the construction. Cracks greater than 1/64 inch (0.5 mm) wide and greater than 25% of the block height is grounds for rejection.

The front face or faces of units that are to be exposed shall be free of chips, cracks or other imperfections that can be seen when viewed from a distance of 30 feet (10 m) under diffused lighting. Up to 5% of the shipment may contain slight cracks or small chips not larger than 1 inch (25 mm).

Color and finish shall be shown on the shop drawings and shall be erected with a running bond configuration.

When cap units are used they shall be cast to or attached to the top of the modular block wall in strict accordance with the manufacturer's recommended procedure.

626.5.1.1.2.1 – Mix Design:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Each manufacturing facility shall provide a copy of their mix design, including test results and material sources, to the MCS&T Division for each type of block. An approved independent lab shall perform the testing when establishing the mix design. The manufacturing facility shall submit test results to MCS&T Division every three years, from an approved independent lab, to verify each mix design. If there are any changes in the mix, such as changes in material sources, any materials such as pigments are added, or the pigment color is changed, then a new mix design is required. The modular block units shall conform to the following:

All of the units shall conform to ASTM C 1372, except that:

(a) 7 units shall be used for testing. An acceptable unit shall be a unit that the compressive strength of that unit is within 10 percent of the average compressive strength. If any of the results exceed the maximum 10 percent variance then that entire unit is discarded from the test and is not an acceptable unit. If more than 2 units are discarded then that mix design is rejected. The average 14 day compressive strength of the acceptable units shall be used as the mix design strength.

(b) The minimum compressive strength requirements shall be 4000 Psi (28 Mpa) at 14 days of age for any acceptable individual unit.

(c) The maximum 24 hour water absorption in accordance with ASTM C67 shall not exceed 8.0 percent for any acceptable unit.

(d) The average density in accordance with ASTM C67 of the acceptable units at 14 days of age shall be used as the mix design density. Item (f) below may be omitted if the density of the cap units is a minimum of 90 percent of the density of the wall units and are produced from the mix design.

(e) The freeze/thaw durability of the acceptable wall units tested in accordance with ASTM C 1262 in a 3% saline solution prior to 85 days of age shall be the minimum of the following:

1) The weight loss of each test specimens at the conclusion of 90 cycles shall not exceed 1% of its initial weight; or
2) The weight loss of each of all but one test specimens at the conclusion of 100 cycles shall not exceed 1.5% of its initial weight, with the maximum allowable weight loss for the last test specimen to not exceed 10%.

(f) The freeze/thaw durability of cap units shall be tested in accordance with ASTM C 1262 in a 3% saline solution prior to 85 days of age shall be the minimum of the following:

1) The weight loss of each test specimens at the conclusion of 40 cycles shall not exceed 1% of its initial weight; or
2) The weight loss of each of all but one test specimens at the conclusion of 50 cycles shall not exceed 1.5% of its initial weight, with the maximum allowable weight loss for the last test specimen not to exceed 10%.

(g) ASTM C 1262 test results shall be recorded and reported in 10 cycle intervals.

The units shall be considered one day old 24 hours after they have been removed from steam curing.

626.5.1.1.2.2 – Modular Block Production:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

The manufacturing facility shall contact the MCS&T Division a minimum of 7 days prior to the start of any production of Modular Blocks.

Each manufacturing facility shall provide the Engineer with a copy of their quality control plan and procedures.

Sampling and Compressive Strength Testing shall conform to ASTM C 140, except:

Section 6.2.4 shall be deleted and replaced with the following:

> "The specimens shall be coupons cut from a face shell of each unit and sawn to remove any face shell projections. The coupon size shall have a height to thickness ratio of 2 to 1 before capping and a length to thickness ratio of 4 to 1. The coupon shall be cut from the unit such that the coupon height dimension is in the same direction as the unit height dimension. Compressive testing of full size units will not be permitted. The compressive strength of the coupon shall be assumed to represent the net area compressive strength of the whole unit."

Density and absorption testing shall conform to ASTM C67.

Each manufacturing facility is required to sample and test each block type at the rate of one sample per 5000 units of continuous production from each mix design or fraction thereof (if production is interrupted) as part of their overall quality control testing. Each manufacturing facility shall forward all quality control test reports and documentation to the MCS&T Division. The manufacturing facility or other testing facilities may perform this quality control testing.

The average compressive strength of each lot of the modular block units shall be a minimum of 90% of the mix design strength, and the average density of each lot shall be a minimum of 95 percent of the mix design density. If the compressive strength or density criteria are not met, then the modular blocks in that lot are rejected and cannot be incorporated into the work unless that lot is tested and found to be acceptable under section 626.5.1.1.2.1.

Cap units and wall units shall be sampled and tested as separate block types.

Minimum manufacturer testing shall include 2 sets of 5 randomly selected units and the following testing:

a. Fourteen (14) day Compressive Strength. Five units shall be used for compression testing. The maximum permissible range between units from the same production batch is 10 percent of the average. If any of the results exceed the maximum 10 percent variance then that entire unit is discarded from the test. The average of the acceptable units shall be used as that lot's compressive strength. A minimum of three units must be found to be acceptable. If less than three units are found to be acceptable the first set shall be discarded and the remaining set shall be tested and used as the basis for acceptance.
b. Fourteen (14) day Density in accordance with 626.5.1.1.2.1 (average of the same acceptable units used above for compressive strength)

The MCS&T Division will randomly select 10 units for testing by the Division for every 15,000 units of continuous production from each mix design or fraction thereof (if production is interrupted). MCS&T may require the manufacturer to conduct freeze/thaw durability testing when inconstancies in the test results arise.

Cap units may not be tested (except for density) if they are manufactured from the same approved mix design as the wall units provided that the wall units in the same production batch are accepted.

The Surface temperature of the modular block units shall not be permitted to fall below 35° F (2° C) until the compression strength of that lot has reached a minimum of 2,000 psi.

626.5.1.1.2.3 – Sealing: All modular block retaining wall surfaces shall be sealed. This work shall consist of preparation, furnishing and applying the surface sealer to the exposed front face, of all the wall units, as well as the back side of the upper courses of the wall layer of reinforcement, and the top of the uppermost block or cap unit.

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Sealers shall meet the requirements of 707.12.

Due to the potentially hazardous ingredients contained in sealer formulations extreme care must be exercised in their handling and use, and the manufacturer's recommendations shall be closely followed.

Construction Requirements:

1. The Contractor shall comply with the manufacturer's written instructions for preparing, handling and applying the surface sealer.
2. The surface to be treated shall receive a light water-blast to the extent that the surface is clean and free of oils.
3. Before the surface sealer is applied, the surface shall be dry and free of all dust, debris, and frost.
4. Surface sealers shall be applied at the heaviest application rate specified by the manufacturer.

All materials and work performed as specified above will be incidental to the construction of the wall.

626.5.1.1.3 – Wire Facings: Wire facing shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of AASHTO M 32 M/M 32 and welded into the finished configuration in accordance with AASHTO M 55 M/M 55. Galvanizing shall conform to the minimum requirements of AASHTO M 111.

Retention material shall be placed along the back face of the wire facing to retain the backfill behind the wall. Retention material shall be capable of retaining the backfill, UV resistant and shall have a high permittivity.

626.5.1.2 - Soil Reinforcing and Attachment Devices: All reinforcing and attachment devices shall be carefully inspected to insure they are true to size and free from defects that may impair their strength and durability. Ensure that pins used to align the precast components during construction are of the size, shape and material required for the wall system chosen.

626.5.1.2.1 – Metal Soil Reinforcing or Attachment Devices: Cutting of reinforcing strips or mesh at vertical obstacles shall not be permitted. Care must be taken to avoid damage to the galvanized coating during handling, storing, and shipping.

The following requirements shall apply to all soil reinforcing and attachment devices.

A) Reinforcing strips shall be hot rolled from bars to the required shape and dimensions. Their physical and mechanical properties shall conform to ASTM

A-36. Galvanization shall be required and shall conform to the minimum requirements of AASHTO M-111.

B) Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the requirements of paragraph one of Section 709.4. Galvanization shall be applied after the mesh is fabricated and shall conform to the minimum requirements of AASHTO M-111.

C) The tie strips shall be shop fabricated of a hot rolled steel conforming to the minimum requirements of ASTM A-570, Grade 50 or equivalent. Galvanization shall be required and shall conform to AASHTO M-111.

D) Loop embedments shall be fabricated of cold drawn steel wire conforming to ASTM A-510, UNS G-10350 or AASHTO M-32. Loop embeds shall be welded in accordance with ASTM A-185. Both shall be galvanized in accordance with ASTM B-633 or AASHTO M-111.

E) Bolts shall meet the requirements of AASHTO M-164. Nuts shall meet the requirements of AASHTO M-291 Grade DH or AASHTO M-292 2H. Fasteners shall be galvanized in accordance with AASHTO M-232.

F) Connector pins and mat bars shall be fabricated from cold drawn steel conforming to AASHTO M-32 and welded to the soil reinforcement mats as shown in the plans. Galvanization shall be required and shall conform to AASHTO M-111.

626.5.1.2.2 – Geosynthetics Soil Reinforcing or Attachment Devices: Cutting of geosynthetic reinforcing longitudinal to the wall face at vertical obstacles shall not be permitted. End to End splicing of geosynthetic material will not be permitted.

The geosynthetic used shall meet the minimum requirements shown on the shop drawings. Each roll of geosynthetic material shall be labeled as to its properties. Geosynthetics shall be made of polypropylene, high-density polyethylene or high-tenacity polyester fibers having cross-sections sufficient to permit significant mechanical interlock with the soil/backfill. Geosynthetics shall have a high tensile modulus in relation to the soil/backfill. Geosynthetics shall have a high resistance to deformation under sustained long term design loads while in service and resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

Store the geosynthetics in conditions above 20º F [-7º C] and not greater than 140º F [60º C]. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement in the wall system.

Carefully inspect all reinforcement to ensure they are the proper size and free from defects that may impair their strength and durability.

The geosynthetic reinforcement structure shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction. The contractor shall submit a manufacturer's certification that the geosynthetics supplied meets the design criteria shown on the shop drawings, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the

Engineer can require the contractor to supply test data from an approved laboratory to support the certified values submitted.

The Contractor's submittal's package shall include actual test results for tension/creep, durability/aging, construction damage, pullout, quality control and a copy of the Manufacturers installation procedures. Also included should be the Long -Term Design Strength **(LTDS)** of the Geosynthetic material. The Manufacturer shall also provide written certification that all resin used to produce the geosynthetic is virgin and classified as high density polyethylene, polypropylene, or high tenacity polyester and is capable of withstanding direct exposure to sunlight for 14 days with no measurable deterioration as per **ASTM D4355.**

The allowable tensile strength shall not exceed 30% for class 1 walls and 25% for all other walls of the ultimate tensile strength of the reinforcement used. The allowable tensile properties of geosynthetic reinforcement as shown on the shop drawings shall be calculated using the following method.

Property	Method
Tensile Strength Ultimate, kN/m	ASTM D4595
Long-term (Ta), kN/m	FHWA/SA-93-025

Where: $\mathbf{T_a = T_{ult}/\{(RF_{cr})(RF_{id})(RF_{du})\}}$
(as described in FHWA/SA-93-025)

$\mathbf{T_{ult}}$, Ultimate Tensile Strength shall be the minimum average roll value ultimate tensile strength as tested per ASTM D4595.

$\mathbf{RF_{cr}}$, Partial Factor for Creep Deformation, is the ratio of T_{ult} to the creep limited strength determined in accordance with ASTM D5262. The test results shall be extrapolated for a 100 year design life per GRI GG4. Creep performance data of a polymer product at a designed temperature is limited to one order of magnitude in extrapolation. Creep performance data at an elevated temperature permits an additional order of magnitude in extrapolation with time temperature superposition principals. Elevated temperature testing of the specific geogrid for 10,000 hours or creep testing at room temperature for 100,000 hours is required. Creep limited strength testing is required on representative samples of the finished product for each product proposed for use and not a single component of the geogrid (i.e. polymer strand). Default values for RF_{cr} are not allowed.

$\mathbf{RF_{id}}$, Partial Factor for Installation Damage, shall be determined from construction damage tests for each product proposed for use with project specific representative or more severe backfill and construction techniques. The backfill soil used if other than project specific, shall have

a D50 > 1" (30 mm) sieve. Testing shall be consistent with GRI GG4. A Maximum RF_{id} value shall be used if such testing has not been conducted.

RECOMMENDED VALUES FOR RF_{id}		
Geosynthetic	Min RF_{id}	Max RF_{id}
HDPE uniaxial goegrid	1.20	1.45
PP biaxial geogrid	1.20	1.45
PVC – coated PET geogrid	1.30	1.85
Acrylic – coated PET geogrid	1.30	2.05
Woven geotextiles (PP and PET)	1.40	2.20
Nonwoven geotextiles (PP and PET)	1.40	2.50
Silt – film woven PP geotextiles	1.60	3.00

RF_{du}, Partial Factor for Durability / Aging is the combined partial factor for potential chemical and biological degradation. RF_{du} shall be determined from polymer specific (HDPE and PP as identified by specific gravity and melt flow index and PETP as identified by CEG number and intrinsic viscosity) durability testing covering the range of expected soil environments. Prior to approval by the Engineer, the manufacturer shall submit test results from a minimum of at least four (4) tests conducted in accordance with EPA 9090 at temperatures of 73° and 122° F (23° and 50° C). EPA 9090 test results shall include the following minimum number of leachate types:

pH	**Minimum # of test results**
$3 \le pH \le 7$	1
$7 < pH \le 9$	1
$9 < pH < 11$	1
$11 \le pH \le 14$	1

As a minimum, the following tests should be performed for geogrids after immersion in the above-described leachates:

Test	**Test Procedure**	**Max %Change Allowed**
Mass per Unit Area	EPA 9090	±1.0
Dimensions	EPA 9090	±1.0
Thickness	ASTM D374C	±5.0
Wide Width Strip Tensile	ASTM D4595	-2.0

FS_d shall not be less than the recommended minimum values discussed in FHWA/RD-89-186 and listed below:

High Density Polyethylene (HDPE)	1.10
Coated High Tenacity Polyester (PETP)	1.15
Polypropylene (PP)	1.25
Geotextiles	1.60
Uncoated High Tenacity Polyester (PETP)	1.60

1. Composite (flexible/coated) geogrids shall be evaluated based on the durability characteristics of the interior reinforcement polymer. Therefore, any protective coating shall be removed prior to durability testing unless a minimum 40-micron coating thickness is used on flexible geogrids and certified by the manufacturer.

2. For soils of potential concern, as presented below (modified soils shall include lime stabilized soil, cement stabilized soil or concrete), only polymers listed as "no effect" shall be used within or adjacent to (3 feet shortest measurable distance) these soil environments (Ref: Table 28, FHWA/RD-89-186).

SOIL ENVIRONMENT	**PETP**	**PE**	**PP**	**PVC**
Acid Sulfate Soils	?	NE	?	?
Organic Soils	NE	NE	NE	?
Salt Affected Soils	?	NE	NE	NE
Ferroginous	NE	NE	X	?
Calcareous	X	NE	NE	?
Modified Soils	X	NE	NE	?

NE = No Effect
? = Questionable Use
X = Not Recommended

RECOMMENDED MINIMUM VALUES FOR RF_{du}					
Products	Aging Reduction factor, RF_{du} – 100 years				
	pH □ 3	3 < pH □ 5	5 < pH < 8	8 □ pH < 9	pH □ 9
PET Geotextiles Mn < 20,000 40<GEG<50	*	2.0	1.6	2.0	*
PET Coated Geogrids Mn > 25,000 GEG<30	*	1.3	1.15	1.3	*
Polypropylene & HDPE Geogrids	1.1	1.1	1.1	1.1	1.1

* use of materials in this pH range is not recommended but can be used if product specific testing is done.

626.5.1.3. - Joint Materials: Joint materials are to be installed to the dimensions and thicknesses in accordance with the plans or approved shop drawings, unless otherwise indicated:

A. Provide either preformed EPDM rubber pads conforming to ASTM D-2000 for 4AA, 812 rubbers; neoprene elastomeric pads have a Durometer Hardness of 55 ± 5; or polyethylene bearing pads meeting the density requirements of ASTM D-1505 in horizontal joints between elements.

B. Cover all joints between elements on the backside of the wall with a geotextile fabric that meets the requirements of Section 715.11.4 of the Standard Specifications. The minimum width and lap of the fabric shall be as follows:

   Vertical and horizontal joints: 12" (300 mm); lap-4" (100 mm).

626.5.1.4 - Acceptance: The Contractor shall furnish the Engineer a Certificate of Compliance certifying the above materials comply with the applicable contract specifications.

626.5.2 - Concrete Leveling Pad: All concrete used in the leveling pad shall as a minimum conform to Section 601 of the Standard Specifications for Class C Concrete.

626.5.3 - Select Granular Backfill:

626.5.3.1- Test Requirements: A11 backfill material used in the structure volume shall conform to the following gradation limits as determined by AASHTO T-27:

Sieve Size	Percent Passing
4 inches (100 mm)	100
No. 40 (375 µm)	0 - 60
No. 200 (75 µm)	0 - 15

The backfill shall conform to the following additional requirements:

A. The plasticity index (P.I.) as determined by AASHTO T-90 shall not exceed 6, or the material is described as non-plastic.

B. The material shall exhibit an angle of internal friction of not less than 34 degrees, as determined by the standard Direct Shear Test, utilizing a sample of the material compacted to 95% of AASHTO T-99, Methods C or D (with oversized correction as outlined in Note 7) at optimum moisture content. No testing is required for backfills where 80% of sizes are greater than ¾ inch (19 mm).

C. Soundness: The materials shall be substantially free of shale or other soft, poor durability particles. The material shall have a magnesium sulfate soundness loss of less than 30% after four cycles as determined by AASHTO T-104, or a sodium sulfate loss of less than 15% after five cycles as determined in accordance with AASHTO T-104.

D. Electrochemical Requirements: The backfill materials shall meet the following criteria:

Requirements	Test Methods
***Resistivity greater than 3,000 ohm Centimeters	AASHTO T-288
**Ph 5-10	AASHTO T-289
*Chlorides less than 100 parts per million	AASHTO T-291
*Sulfates less than 200 parts per million	AASHTO T-290
Organic Content: 1% maximum	AASHTO T-267

* If resistivity is greater than 5,000 ohm-cm, the chlorides and sulfates requirements may be waived. Requirement is waived if geosynthetics are used for soil reinforcements and attachment devices.

** May be adjusted if geosynthetic material is used for soil reinforcements or attachment devices see shop drawings and section 626.5.1.2.2.

*** Requirement is waived if geosynthetics are used for reinforcements and attachment devices.

E. Steel slag as defined in 703.3.1 shall not be used in this item.

626.5.3.2 - Quality Control Testing: Quality control of the select granular material is the responsibility of the contractor as specified in 106.1.

The Contractor shall maintain equipment and qualified personnel to perform all sampling and testing necessary to determine the magnitude of the various properties of the material governed by the Specifications and shall maintain these properties within the limits of the Specifications.

The Contractor shall design a Quality Control Plan detailing the methods by which the Quality Control Program will be conducted. The plan prepared in accordance with the guidelines set forth in the appropriate portions of MP 307.00.50 and MP 717.04.21, shall be submitted to the Engineer at the preconstruction conference. The work shall not begin until the plan is reviewed for conformance with the contract documents.

626.5.3.3 - Sampling and Testing: Frequency of sampling and testing shall be in accordance with the Contractor's Quality Control Plan. The minimum frequencies for gradation and plastic limits shall be as stated in MP 717.04.21, Table D, for subgrade.

626.5.3.4 - Acceptance: The Contractor shall furnish certified test results that the select granular backfill meets the contract specifications. The test results for the select granular backfill shall not be used to verify compliance for a period exceeding one year. The Division may request that the tests be performed at any time if the material changes. Additional tests for gradations and plastic limits shall be determined during the placement of the material.

Acceptance for compaction shall be on a LOT-by-LOT basis. A LOT shall be divided into five approximately equal sized sub-lots. A sub-lot shall consist of the quantity of material to backfill a single lift for 100 feet (30 m) of wall and at least one test per lift. One nuclear moisture and density measurement shall be made at a random location within each of the five sub-lots according to MP 207.07.20 for material having less than 40% retained on the ¾ inch (75 mm) sieve and MP 700.00.24 for material having 40% or more retained on the ¾ inch (75 mm) sieve. The moisture tolerance shall be from optimum to two percentage points below optimum. The random locations shall be determined in accordance with MP 712.21.26. The target percentage of dry density shall be 95%. For applications where spread footings are used to support a bridge or other structural loads, the target percentage of dry density shall be 100%. If the results of five density tests on a LOT indicates that at least 80% of the material, in accordance with 106.3.1 (West Virginia AP-A), has been compacted to the specified target percentage of dry density, the LOT will be accepted. If less than 80 % has been compacted to the specified target percentage of dry density and/or the moisture content is outside the tolerance range, no additional material shall be placed until the LOT has been reworked to meet the specified requirements. Reworking and retesting shall be at the expense of the Contractor. When the Division performs the testing in the evaluation of reworked LOTs, the testing will be at the expense of the Contractor at the unit cost specified in 109.2.2.

The backfill material must compact to a stable condition. If the material is not stable under the weight of construction equipment, the contractor must correct the problem or replace the material even if test results indicate that the material meets the moisture and density specifications.

The contractor's gradation data shall be evaluated in accordance with applicable sections of Section 307 except that Table 704.6.2 shall not apply. Gradation limits shall be in accordance with Table 703.4. The certification is to include the test results. A revised unit price for calculation purposes will be established based on the delivered quantities and delivered aggregate cost.

626.6 - CONSTRUCTION METHODS:

626.6.1 - Mechanically Stabilized Earth:

626.6.1.1 - Foundation Preparation: The foundation for the structure shall be graded level for a width equal to the length of reinforcement elements plus one (1) foot (300 mm) or as shown in the plans. Prior to wall construction, except where constructed on rock, the foundation shall be compacted with a

smooth wheel vibratory roller. Any foundation soils found to be unsuitable shall be removed and replaced with select granular backfill as per Section 614.5.1.4 of the specifications.

626.6.1.2 - Wall Erection: A MSE wall supplier representative shall be present a minimum of three (3) days and as required thereafter during erection of the wall to assist the fabricator, contractor, and Engineer. The cost of the representative shall be considered incidental to the unit price of the MSE Wall System.

When facing elements are handled by means of lifting devices they shall be lifted by connecting to the upper edge of the element.

Facing elements shall be placed so that their final position is vertical or battered as shown in the plans. Facing elements shall be placed in successive horizontal lifts in the sequence shown in the plans as backfill placement proceeds. As backfill material is placed behind the elements, the elements shall be maintained in position by means of temporary wedges or bracing according to the wall supplier's recommendations. The Contractor shall not have more than two levels of temporary wedges in place at any time during wall erection. Concrete facing vertical tolerances and horizontal alignment tolerances shall not exceed ¾ inch (19 mm). The overall vertical tolerance of the wall (top to bottom) shall not exceed ½ inch (13 mm) per 10 feet (3 m) of wall height.

Reinforcement elements shall be placed normal to the face of the wall, unless otherwise shown in the plans. Prior to placement of the reinforcing elements, backfill shall be compacted in accordance with these Specifications.

626.6.1.3 - Backfill Placement: Backfill placement shall closely follow erection of each course of facing elements. Backfill shall be placed in such a manner as to avoid any damage or disturbance of the wall materials or misalignment of the facing or reinforcing elements. Any wall materials that become damaged during backfill placement shall be removed and replaced at the Contractor's expense. The Contractor at his expense shall correct any misalignment or distortion of the wall facing elements due to placement of backfill outside the limits of this specification. At each reinforcement level, the backfill shall be placed to the level of the connection. Backfill placement methods near the facing shall assure that no voids exist directly beneath the reinforcing elements.

The backfill required to be placed in front of the wall, from the leveling pad to finished ground, shall be placed immediately after the select granular backfill is above the first layer of soil reinforcing.

The maximum lift thickness after compaction shall not exceed 6 inches (150 mm) unless approved by the Engineer. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum

moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

Compaction within 3 ft. (900 mm) of back face of the wall shall be achieved by at least three passes of a lightweight mechanical tamper, roller, or vibratory system.

At the end of each day's operation, the Contractor shall slope the last level of the backfill away from the wall facing to rapidly direct runoff away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

One foot (300 mm) behind the modular block units and the modular block unit cores shall be filled with crushed granular material with less than 2% passing the #200 (75 µm) sieve and shall be consistent with the manufacture recommendation. If the modular block unit cores are not accessible the engineer may upon the advice of the wall designer omit the fill in the modular block cores.

626.6.2 - Cast-in-Place Reinforced Concrete:

626.6.2.1 - General: Except as otherwise shown in the plans or herein, construction methods for cast-in-place retaining walls shall comply with the Standard Specifications.

Construction methods for the following shall be per the indicated section of the Standard Specifications:

Item	Section
Unclassified Borrow Excavation	211
Structure Excavation	211
Wet Excavation	212
Select Material for Backfilling	212
Select Material for Backfilling	212
Concrete	601
Reinforcing Steel	602

626.6.2.2 - Architectural Forms:

626.6.2.2.1 - General: Construct forms to sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, chamfers, blocking, screeds, bulkheads, and other items as required.

Fabricate forms to prevent cement paste from leaking while placing concrete and for easy removal without hammering or prying against exposed concrete surfaces. Provide crush plates where stripping might damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete. Solidly butt joints and provide backup material at joints to prevent leakage and fins. Assemble forms so that they may be easily removed without damaging exposed concrete surfaces

Provide temporary form openings where inaccessible formwork interior can be cleaned and inspected before placing concrete. Place temporary form openings as inconspicuously as possible, consistent with project requirements.

When drilling forms used for exposed concrete, drill from the contact face to the outside to suit the ties used and to prevent leakage of concrete mortar. Do not splinter the forms by driving ties through improperly prepared holes.

Unless otherwise shown in the plans:

- Provide sharp, clean corners at intersecting planes with no visible edges or offsets; or provide accurately formed chamfered corners using ¾ x ¾ inch (19 x 19 mm) strips, surfaced to produce uniformly straight lines and tight edge joints.

626.6.2.2.2 - Form Coatings: Coat form contact surfaces with form-release agent before placing reinforcement. Do not allow excess material to accumulate in forms or to come into contact with reinforcement or surfaces that will be bonded to fresh concrete. Apply coating according to manufacturer's instructions.

Coat steel forms with non-staining, rust-preventative release agent, or otherwise protect from rusting. Rust-stained steel formwork is not acceptable.

626.6.2.2.3 - Reusing Forms: Split, frayed, delaminated, or otherwise damaged form-facing materials are not acceptable. Clean and apply a new form-release agent to concrete contact surfaces.

626.7 - METHOD OF MEASUREMENT:

626.7.1 - General: The unit of measurements shall be the gross area in square feet (square meters) lying in a plane outside the front face of the structure as determined by the dimensions in the contract documents. The gross area shall not include barriers, footings, or leveling pads. The gross area shall be the number of square feet (square meters) established in the proposal, subject to adjustment as provided in Sections 104.2 and 109.2 of the Standard Specifications. No adjustment of pay quantity shall be allowed for changes in wall design to facilitate the Contractor's methods of construction of wall type.

Unless otherwise specified in the contract documents, items such as concrete barriers that are not part of normal retaining wall construction shall be measured separately for payment.

The quantity of earthwork shown in the plans does not include any work within the wall pay limits shown in the plans. Any adjustments to the required amount of embankment or select granular backfill due to the particular wall system proposed by the contractor shall be considered incidental to the project. No separate payment shall be made for increased embankment or increased select granular backfill requirements. The Contractor shall be responsible for any of the cost of changes in waste, borrow, or earthwork quantities from those shown in the plans caused by the requirements of the proposed wall system.

626.7.2 - Mechanically Stabilized Earth: The unit price shall include in place: facing elements, soil reinforcing and attachment devices and associated hardware, coping and trim, or similar items that are normal parts of wall construction. No separate measurement of these items shall be made.

The unit price shall also include, in place, all the following items shown within the wall pay limits in the plans: select granular backfill, excavation, embankment, foundation preparation, and leveling pads. No separate measurement of these items shall be made.

626.7.3 - Cast-in-Place Reinforced Concrete: The unit price shall include in place: concrete, reinforcing, joint materials, underdrains, weepholes, or similar items that are normal parts of wall construction. No separate measurement of these items shall be made.

The unit price shall also include in place: all the following items shown within the wall pay limits in the plans: select material for backfilling, excavation, embankment, and foundation preparation. No separate measurement of these items shall be made.

626.8 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract price per unit of measurement, respectively, for each pay item listed below and shown in the bid schedule, which prices and payment will be full compensation for the work prescribed in this section.

626.9 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
626001-*	RETAINING WALL, CAST-IN-PLACE REINFORCED CONCRETE	Square Foot (Meter)
626002-*	MSE RETAINING WALL , “vender name”	Square Foot (Meter)
626003-*	MSE MODULAR BLOCK RETAINING WALL , CLASS “class”, “vender name”	Square Foot (Meter)
626004-*	MSE WIRE FACE RETAINING WALL, “vender name”	Square Foot (Meter)

* Sequence number
class – From approved vender list

SECTION 636
MAINTAINING TRAFFIC

636.2 – MATERIALS:

ADD THE FOLLOWING AS THE SECOND PARAGRAPH OF THE FIRST NOTE AFTER TABLE 636.2.

When aggregate is to become part of any succeeding base, all requirements of Section 307 for base course shall apply.

636.9-TRAFFIC CONTROL DEVICES:

INSERT THE FOLLOWING AFTER THE SECOND PARAGRAPH:

If the project is on an Interstate Highway, an APD (Appalachian Highway Corridor), a controlled access highway with posted speed limit of 40 Miles Per Hour (MPH) or greater, or if otherwise noted on the plans, Traffic Control Devices shall include work area signs designated "GIVE 'EM A BRAKE" (GEAB). The sign size, message, and design shall be as shown on Sign Fabrication G30-1 or as directed by the Engineer.

The sign (item 636011-*, 300 units) shall be installed 500'-1500' after the first lead-in work area sign unless the work zone is greater than one (1) mile, in length, in which case the GEAB sign shall be installed approximately ¼ mile in advance of the active work area. At no time shall the GEAB sign be closer than 500' from any other work area signing. The sign shall be installed in both directions on the right side of the highway. All GEAB signs shall be installed on three, 3 pound per foot u-channel posts driven to a depth of 3 ½ feet. The u-channel posts shall be continuous in length, or a combination of a stub driven to a depth of 3 ½ feet, an approved splice arrangement and an appropriate length supporting post.

GEAB sign shall only be installed in active work areas where workers are present and visible to passing motorists. During periods of inactivity in the work area, the GEAB sign(s) shall be covered or removed.

636.11 - FLAGGER – TRAFFIC DIRECTOR:

DELETE THE THIRD SENTENCE AND SUBSTITUTE THE FOLLOWING:

Hand signaling devices, and approved vests shall be used by the Contractor's personnel assigned to traffic control responsibilities. Approved headgear, if worn, and vests worn by the Contractor's personnel shall not bear the Division symbol. Wireless two-way communication shall be provided to the flaggers when they are out of sight of each other.

636.19 - CHANGEABLE MESSAGE SIGN:

DELETE THE HEADING AND CONTENTS AND REPLACE WITH THE FOLLOWING:

636.19 - PORTABLE MESSAGE SIGNS:

636.19.1 – General: Portable Message signs shall consist of the furnishing, installing and maintaining of a variable message sign on a portable trailer. Each unit shall be self-contained and consist of a display board, controller, power supply, electrical cable and adjustable height structural support system. It shall be equipped to accept power supply from a completely self-contained diesel generator, existing commercial electrical service, or battery pack which is recharged automatically by solar panels. The trailer system assemblage shall conform to the laws of the State of West Virginia and all articles of the licensing regulations presently in effect. The sign shall only be attached to its tow vehicle when installation or removal is in progress. The trailer and its leveling jacks shall be designed to keep the unit from changing its deployed position once placed. Devices that lock the wheels and/or leveling jacks into place shall be employed. Sandbagging of the frame and/or leveling jacks is not an acceptable manner of lock down.

The unit shall be kept in good repair at all times. The Contractor shall maintain the device if failures occur. Failure, malfunction or damage to the unit for any reason shall require the Contractor to expedite the repair and furnish adequate signing and flaggers as deemed necessary by the Engineer to safely control traffic through the work area. Maintenance shall include periodic cleaning of the unit.

All parts of the system shall comply with codes annotated in the National Fire Protection Association and Underwriters Laboratory and all local electrical codes. Earth ground shall be tied to the sign's chassis. Lightning protection shall be supplied for the load site.

636.19.2 – Display: The Portable Message Sign shall be the disc matrix or LED lamp matrix panel type capable of operating in temperatures from –30° to +160° F (-36° to 72° C) and capable of displaying alphanumeric characters and arrows. The sign panel assembly, including the mounting brackets, shall not exceed 128 inches (3.15 meters) in overall width. The bottom of the sign panel shall be a minimum of 7 feet (2.13 m) above the roadway. A minimum character height of 18 inches (450 mm), and character spacing at a minimum of two dots or one half the character width, unless otherwise approved by Engineer.

The trailer shall be marked with a minimum of 200 square inches (1.29 square meters) of four-inch (100 mm) alternating red/white conspicuity marking material (WV Type VI / Fed. Type IX Retroreflective sheeting) to be visible by motorists approaching the trailer from any direction.

If battery backup (in event of power interruption) is called for on the plans, all functional operations to include sign lighting shall be operational up to two hours.

Fluorescent lighting or LED lamp matrix shall be applied to provide nighttime visibility and the intensity of the sign shall be adjustable by automatically dimming or manual control.

636.19.3 – Sign Types:

636.19.3.1 - Changeable Message Sign: The Changeable Message Sign system shall have three (3) lines, unless otherwise noted on the plans and shall conform to the general requirements of 636.19.1. The unit shall have several preprogrammed messages and be capable of programming at least fifty new messages and storing such. The controller shall be housed in a weatherproof lockable cabinet that is accessible from a suitable mounting on the trailer. The controller shall be a microprocessor controller or laptop computer with an incorporated keyboard and CRT that allows the users to access, generate, and store messages. The controller display shall be a miniaturized approximation of the actual display or a message being assembled. The display shall be yellow or amber character on black background, a 7 x 5-character font.

The cycle time and duration of message for a changeable message sign is a function of the highway operating speeds and the size letters displayed. The entire message should be visible at least twice at the operating speed. When traveling at 65 MPH (105 km/h) (freeway speeds), a driver has approximately seven (7) seconds to read the message, the message should not be longer than four (4) words or numbers and not longer than two (2) units of information. The message displayed from each unit shall be visible from one-half mile (805 meters).

The sign shall be capable of changing to and displaying a programmed default message or four corner dots flashing in the event of power failure.

636.19.3.2 – Speed Monitoring Trailer: A Speed Monitoring Trailer system shall conform to the general requirements of 636.19 and shall consist of a trailer, radar, and display. The unit should be operational only while work is in progress.

636.19.3.2.1 – Radar: The radar unit shall be capable of an output in miles per hour (mph) or kilometers per hour (km/h) operating at a frequency of 24.15 GHz (K-Band) ± 100 MHz accurate to within 3 mph at a target speed of 10 to 199 mph (16 to 230 km/h).

636.19.3.2.2 – Display: The display board shall be a minimum two-digit, high brightness, amber display on a black background. The system shall be equipped with a violator alert feature. This feature shall change the display from steady amber to flashing amber and flash the speed reading when a vehicle exceeds a programmable speed threshold. This threshold shall be adjustable. The display shall be mounted a minimum height of 4 feet (1.2 meters) above the roadway.

A 7-inch (175 mm) by 36-inch (900 mm) plaque reading “YOUR SPEED” in black letters on a yellow background shall be mounted directly above or directly

below the display. The rack shall be secured with a lockable fastener and shall provide room to mount a minimum 30-inch (750 mm) by 36-inch (900 mm) speed limit sign (R2-1) above the display.

636.19.4 – Placement: Site selection, protection from traffic, and message displayed shall be approved by the Engineer. A changeable message sign and a speed monitoring trailer are not to be placed where they conflict with one another.

The changeable message sign shall always be located behind the channelizing devices or barriers away from moving traffic lanes. In work zones, it shall be located in clear buffer barricades without reducing the sign's visibility.

The speed monitoring trailer system shall be located within the area of the reduced work zone speed limit, but shall not be located within or before a transition or taper. At locations where the shoulder is open, cones shall be tapered at 25 feet (7.5 meters) centers for a distance of 200 feet (61 meters) on the approach to the unit to differentiate it to oncoming motorists.

636.23.6 - Traffic Control Devices:

DELETE THE ADDRESS AND SUBSTITUTE THE FOLLOWING ADDRESS:

Materials Control, Soils, & Testing Division
190 Dry Branch Road
Charleston, West Virginia 25306

636.23.22 - Changeable Message Sign:

DELETE THE HEADING AND CONTENTS AND REPLACE WITH THE FOLLOWING:

636.23.22 - Portable Message Sign:

The quantity of “Changeable Message Sign” and “Speed Motoring Trailer” shall be the actual number of days that the sign is used on the project.

636.24 - BASIS OF PAYMENT:

ADD THE FOLLOWING AFTER THE FIRST PARAGRAPH:

When a portable message sign or speed monitoring trailer is to become the property of the Division, each unit shall be delivered with the following items:

i. Operator's manual for sign-raising mechanism and sign operations.
ii. Schematic wiring diagram of the sign, remote control console and the control unit.
iii. Service manual for the sign, sign-raising mechanism control unit and the remote control console.

iv. Record of Serial Numbers, Model Numbers, and Model Types for the Portable message sign and any attendant diesel engine.
v. Warranty on the sign-raising mechanism, sign remote control console and control unit.
vi. Inspection and operational tests.

636.25 - PAY ITEMS:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
636030 *	Speed Monitoring Trailer	Per Day

* Sequence Number

SECTION 637
WATER

637.4 - METHOD OF MEASUREMENT:

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

Water used by the Contractor for purposes other than those specifically included in the item shall not be paid for separately.

When the excavation is less than 10,000 cubic yards (meters) and separate payment for water is not included in the plans the water shall be incidental to the work and shall not be paid for separately.

SECTION 640
FIELD OFFICE AND STORAGE BUILDING

DELETE THE ENTIRE SECTION REPLACE WITH THE FOLLOWING:

640.1 - DESCRIPTION:

This work shall consist of furnishing and maintaining in good condition suitable offices for the exclusive use of the Engineer as a field office or for making field tests, a storage building for concrete cylinder curing tanks, and equipment for the field office, all in accordance with these Specifications.

640.2 - MATERIALS:

Not specified.

640.3 - LOCATION AND TIME OF ERECTION:

The field office and storage building shall be set up at approved locations on or in the immediate vicinity of the Project. They shall be separated from any building used by the Contractor.

The field office and storage building shall be set up, equipped, and made ready for use at least three days prior to the beginning of the work on the project.

640.4 - FIELD OFFICE:

640.4.1 - General: The office shall be entirely enclosed, waterproofed, and sealed inside with wall board which will provide efficient insulation against heat and cold. With the exception of a minimal field office, the office must be decent, safe and sanitary in accordance with Health Department regulations.

The office shall be provided with an approved type of heating and cooling equipment that will maintain a comfortable seasonable temperature throughout the project life. It shall be furnished with satisfactory electric lighting and lighting service. A minimum of two duplex convenience outlets shall be provided in each room. The building shall be provided with neat, sanitary, enclosed toilet with exhaust fan accommodations for the exclusive use of the Engineer, and such facilities shall meet the requirements of the State Department of Health or other authorities having jurisdiction. It shall be stocked with lavatory and sanitary supplies at all times during the period of the Contract.

The office shall be attractively painted on the outside and shall be provided with a sign at least 4 feet (1.2 m) by 1 ft. (300 mm), with the sign content as follows:

FIELD OFFICE—THE WEST VIRGINIA
DIVISION OF HIGHWAYS

The letters shall not be less than 3 inches (75 mm) high and shall be white on a black background. The sign shall have a white border at least 1½ inches (38 mm) wide.

The office shall be equipped per section 640.10 and shall include OSHA approved steps and entrance porch with railing.

640.4.2 - Large field office: The large field office shall have a minimum floor space of 800 sq. ft. (80 sq. meters). This may be accomplished by the use of two (2) standard field offices or one large equivalent office. The office shall contain the following additional equipment:

1) One office type desk having at least two drawers on each side and one secretarial type desk each having minimum top dimension of 30 inches by 60 inches (750mm by 1 500 mm).
2) One plan rack.
3) One utility table 30 inches (750 mm) high and having top dimensions not less than 30 inches by 72 inches (750 mm by 1 800 mm).
4) One sanitary-type water cooler supplied with water that shall be kept cooled electrically or with gas.
5) One desk model electronic adding machine with, tape totaling a minimum of 10 digits.

6) One desk model, and two hand held model electronic calculators (all equipped with scientific functions), with a minimum entry of 10 digits and a minimum readout of 10 digits.

640.4.3 - Standard Field Office: The standard field office shall have a minimum floor space of 400 sq. ft. (40 square meters) and shall contain two rooms, each with a minimum plan dimension of 20 ft. by 10 ft. (4 by 5 meters). One room shall contain sufficient floor area to include such soil equipment necessary to perform the various compaction control tests as may be required as the work progresses.

640.4.4 - Small Field Office: The small field office shall have a minimum floor space of 250 sq. ft. (23.2 sq. m) and shall contain two rooms, each with a floor space of approximately 10 ft. by 12 ½ ft. (3.1 by 3.75 m).

640.4.5 - Minimal Field Office: The field office shall have a minimum floor space of 100 square feet (9.3 square meters) with a minimum plan dimension in one direction of 6 ft. (1.8 m). When a sanitary enclosed toilet is not provided, a chemically treated portable toilet shall be provided. The office shall be furnished with a desk, chair, one fireproof filing cabinet equipped with locks, one desk top copier capable of producing 8½ x 11 and 8½ by 14 copies and a phone, fax and answering (message) machine that utilizes the same phone line. The door for the field office shall be provided with a suitable lock. A sanitary water cooler using bottled water or approved equal shall be provided. The requirements of sections 640.10 and 640.11 shall not apply.

640.5 - STORAGE BUILDING:

The storage building for concrete cylinder tanks shall have a minimum floor space of 80 sq. ft. (7.4 m) preferably 8 feet by 10 feet (2.4 by 3.1 m). The ceiling height shall not be less than 7 feet (2.1 m). The storage building shall be well insulated and capable of maintaining a reasonably constant temperature. It shall be provided with water, as required, and satisfactory electric lighting. Chairs, tables, and stools, as required, shall be furnished.

The Contractor shall furnish curing tanks with sufficient capacity to handle peak cylinder curing requirements. The tanks shall be equipped with thermostatically controlled units which are capable of maintaining specification water temperature in the tanks, and power shall be furnished.

640.6 - LIABILITY FOR PROPERTY IN OFFICE/STORAGE STRUCTURES:

The Contractor shall assume the risk of direct physical damage to or loss of all Division property in the project field office and storage building, and shall compensate the Division for any such damage or loss valued on a replacement cost basis to a maximum total of twenty thousand dollars.

The contractor’s responsibility for this risk will remain in effect until the Division has removed all its property and vacated the office and storage building.

640.7 - MAINTENANCE:

The Contractor for the duration of the project shall maintain the field office and storage building in good condition and appearance. No compensation will be allowed for loss by fire or by vandalism caused by non-Division personnel or for loss due to normal wear and tear.

640.8 - REMOVAL:

After all field records pertinent to the project have been completed, the office and storage building shall be removed and disposed of by the Contractor and the site cleaned up and left in a neat and acceptable condition. The field office and storage building shall be allowed to remain for 45 days after final acceptance of the project, and shall be completely removed prior to 60 days after final acceptance of the project.

640.9 - ALTERNATE FOR OFFICE BUILDING:

The Contractor, in lieu of the field office building, may furnish adequate trailer space equivalent to the minimum floor space requirements. Minimum requirements for heat, lights, toilet facilities, insurance, maintenance, etc., shall be furnished for the trailer as for the office building.

640.10 - EQUIPMENT:

The following equipment shall be furnished for any field office.

1) One office-type desk having at least two drawers on each side and one secretarial-type desk each having minimum top dimension of 30 inches by 60 inches (750 by 1 500 mm).
2) One filing cabinet when the total project bid is less than $1,000,000; two filing cabinets when the total project bid is $1,000,000 and less than $3,000,000; and three filing cabinets when the total project bid is $3,000,000 or more. Cabinets shall be fireproof, four-drawer, legal size, and equipped with locks.
3) One plan rack.
4) One utility table 30 inches (750 mm) high and having top dimensions not less than 30 inches (750 mm) by 72 inches (1 800 mm).
5) One sanitary-type water cooler supplied with water that shall be kept cooled electrically or with gas.
6) One closet extending the full height from floor to ceiling measuring not less than 24 by 30 inches. (600 by 750 mm) in plan, having at least two shelves, and equipped with a lock.
7) One desk model electronic adding machine with tape totaling a minimum of 10 digits.
8) One desk model, and two hand held model electronic calculators (all equipped with scientific functions), with a minimum entry of 10 digits and a minimum readout of 10 digits.
9) Comfortable chairs and stools as required.
10) The Contractor shall provide at their own expense all utilities and janitor service. Telephone service, limited to the best available local facilities, shall be furnished unless Plan notes require alternate communication

facilities. Telephone service shall include installation, local monthly charges, long distance service, maintenance and removal costs.

11) Provide two telephones for a large or standard office and one telephone for a small office. One answering (message) machine shall be provided.
12) One table top copier meeting the following minimum requirements:

    a) Produce 8½ in. by 11 in. (A4 and A3), 8½ in. x 14 in. and 11 in. x 17 in. copies.
    b) Reduction and enlargement features.
    c) Produce a minimum of 10,000 copies per month.
    d) The Contractor shall provide all service and maintenance of the copier.

13) Provide one facsimile data processing unit that is compatible with Division's facsimile equipment.
14) If any of the equipment items are included as "in-built" in the field office or trailer, they may be omitted from the list.
15) Provide on project specific weather monitoring system. The minimum requirements for the weather monitoring system shall be:

    a) Measure and record total rainfall as well as hourly rainfall averages.
    b) Measure and record wind speed.
    c) Measure and record relative humidity.
    d) Measure and record temperatures.
    e) Present data in a neat and orderly fashion.
    f) The weather monitoring systems sensors shall be located as close to the project limits as practical and shall not exceed 1,000 feet without the Engineer's written approval.
    g) All data collected must be transferable to the Department's/Project's computer system.
    h) If the weather monitoring system supplied is capable and high speed internet service is available at the site, the weather monitoring system shall be connected to the internet for remote viewing.

The weather monitoring system ,including hardware, software and manuals, will be furnished and maintained throughout the life of the project and shall be removed when the field office has been vacated by the Division of Highways staff in accordance with 640.8.

640.11 - COMPUTER SYSTEM FOR FIELD OFFICE:

The contractor shall provide one (1) desktop computer system, printer, and related software as specified in the "Approved Source/Product Listings" maintained by Materials, Soils and Testing Division. This listing is also available on the WVDOT web site.

The desktop computer system specifications in effect at the time of the bid opening will become a part of the contract documents.

This desktop computer system, including hardware, software and manuals, will be furnished and maintained throughout the life of the project and shall be

removed when the field office has been vacated by the Division of Highways project staff in accordance with 640.4.5.

The Contractor shall be responsible for all service and maintenance of the entire desktop computer system, including all related hardware and software. Replacement equipment shall be provided within five (5) working days of breakdown, theft or damage at no additional cost to the Division. The Contractor will not be responsible for replacement if the computer system is damaged by misuse or negligence of the division.

640.12 - METHOD OF MEASUREMENT:

The "Large Field Office and Storage Building", "Standard Field Office and Storage Building" shall include the field office and the storage building and shall be measured as one complete unit and paid by the month. The "Small Field Office" and "Minimal Field Office" shall be measured as one complete unit and paid for by the month. The "Building Equipment" and "Computer System for Field Office" will be measured as complete units and paid as a lump sum unit.

640.13 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit prices bid for the items listed below, which prices and payments shall be full compensation for furnishing, erecting, insuring, maintaining and removing the field office and storage building computer system, and sanitary conveniences for the Engineer; all labor and materials, and all other work necessary and incidental thereto. All costs associated with the weather monitoring system will be paid for by the contractor. The field office, storage building equipment, computer system, furniture, fixtures, and facilities shall remain the property of the Contractor and shall be removed in accordance with 640.8 and the area dressed and restored.

Telephone service installation, local monthly charges, long distance charges, maintenance charges and removal costs will be paid by the Contractor. In the event long distance charges exceed the $100.00 per month average for the duration of the project, the Contractor may request compensation for the portion above the $100.00 per month average.

640.14 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
640001-*	Standard Field Office And Storage Building	Month
640002-*	Large Field Office And Storage Building	Month
640003-*	Building Equipment	Lump Sum
640004-*	Computer System For Field Office	Lump Sum
640005-*	Minimal Field Office	Month
640006-*	Small Field Office	Month

* Sequence number

SECTION 642
TEMPORARY POLLUTION CONTROL

642.2 - MATERIALS:

DELETE ITEM vii AND REPLACE WITH THE FOLLOWING:

vii. Engineering fabric for silt fence shall meet the requirements of 715.11.5 and have a minimum width of 3 feet (900 mm). Wood, steel, or synthetic support posts having a minimum length of 3 feet (900 mm) plus the burial depth shall be used. They shall be of sufficient strength to resist damage during installation and to the support applied loads due to material or water build up behind the silt fence.

ADD THE FOLLOWING:

viii. Dewatering Device shall meet the requirements of 715.11.10.

642.4 - GENERAL REQUIREMENTS:

ADD THE FOLLOWING:

A Dewatering Device shall be installed on a slight slope so incoming water flows downhill through the Device without creating more erosion. The neck of the Dewatering Device shall be tightly strapped to the discharge hose. The contractor may place the bag on an aggregate or hay bale bed to maximize water flow through the surface area of the bag.

The Dewatering Device is full when it no longer can efficiently filter sediment or pass water at a reasonable rate. Flow rates will vary depending on the size of the Dewatering Device, amount of sediment discharged into the Dewatering Device, the type of ground, rock, or other substance under the bag and the degree of the slope on which the bag lies. The Dewatering Device will normally accommodate flow rates of 1000 gallons per minute (3 785 liters per minute). Use of excessive flow rates or overfilling the Dewatering Device with sediment will cause ruptures of the bag or failure of the hose attachment straps.

The Dewatering Device shall be disposed of as directed by the engineer.

642.6 - TEMPORARY PIPE, CONTOUR DITCHES, BERMS, SLOPE DRAINS, DITCH CHECKS AND SILT FENCE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

642.6.1 - Temporary Pipe: Temporary pipe and contour ditching shall be provided as necessary to control erosion.

642.6.2 - Contour Ditches and Berms: Prior to suspension of construction operations for any appreciable length of time due to seasonal or other conditions, the Contractor shall shape the top of earthwork in such a manner as to permit and facilitate the runoff of rain water and shall construct earth berms along the top edges of embankments to intercept runoff water. The berm construction shall not be permitted to decrease the stability of the embankment section. In addition, the Contractor shall construct a berm at the end of each day's operation at the top edges of the embankment.

642.6.3 - Slope Drains: Temporary slope drains shall be provided to accommodate the runoff water intercepted above. These drains shall be located as needed and at no greater than 500 ft. (150 m) intervals.

642.6.4 - Ditch Checks: Silt fence or bales of hay or straw shall be used to control erosion and trap sediment as required. Ditch checks shall be constructed in cut or median ditches by installing silt fence or by using wood, plywood, logs, rocks, steel, or other devices to control velocity and to aid in sediment control.

642.6.5 - Silt Fence: The minimum height above ground for the silt fence shall be 2 feet (600 mm). Minimum embedment depth shall be 8 inches (200 mm). The maximum post spacing shall be based on elongation of the geotextile as measured in accordance with Test Method D 4632. Silt fence geotextile with elongation 50 % shall have a maximum post spacing of 4 feet (1.2 m). Silt fence geotextile with elongation < 50 % shall have a maximum post spacing of 6.5 feet (2 m). When silt fence is installed in valleys where water can pond behind the fence then the post spacing shall be half of the maximum post spacing for the geotextile used.

When silt fence is installed by the trenching method the geotextile at the bottom of the fence shall be buried in a "J" configuration to a minimum depth of 8 inches (200 mm) in a trench so that no flow can pass under the silt fence. Backfill the trench and compact the soil over the geotextile.

When silt fence is installed by the soil slicing method the geotextile shall be installed in a slit in the soil 8 to 12 inches (200 to 300 mm) deep so that no flow can pass under the silt fence. Create the slit such that a horizontal chisel point (approx. 3 inches (75 mm) wide) at the base of a soil slicing blade (approx. ¾ inches (18 mm) wide) that slightly disrupts soil upward as the blade slices through the soil. This upward disruption minimizes horizontal compaction and creates an optimal soil condition for mechanical compaction against the geotextile. Overturning of the soil shall not be permitted. The geotextile shall be mechanically inserted directly behind the soil slicing blade in a simultaneous operation, achieving consistent placement and depth.

The silt fence geotextile shall be spliced together with a sewn seam only at a support post, or two sections of fence may be overlapped.

Silt fence posts shall be driven to a minimum of 20 inches (500 mm) into the ground. This depth shall be increased to 2 feet (600 mm) if the fence is placed on a slope of 3:1 (1:3) or greater. Where the minimum depth is impossible to attain,

the posts shall be adequately secured to prevent overturning of the fence due to loading. The geotextile shall be properly fastened to the upslope side of the fence posts.

Silt fences shall be continuous and transverse to the flow. The silt fence shall follow the contours of the site as closely as possible. Place the fence such that the water cannot runoff around the end of the fence.

The silt fence trench shall be compacted on the upstream side first, and then the downstream side. The silt fence trench shall be compacted to a minimum of 90% of the original ground density and the posts must be installed after compaction of the trench. The trench compaction will be based on visual inspection and the engineer may require compaction testing to verify the visual inspection.

The contractor shall inspect all silt fences immediately after each rainfall and at least daily during prolonged rainfall. The contractor shall immediately correct any deficiencies. The contractor shall also make a daily review of the location of silt fences in areas where construction activities have altered the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist as determined by the engineer, additional silt fence shall be installed as directed by the engineer. When the sediment deposits reaches half the height of the fence the sediment shall be removed or a second silt fence shall be installed as directed by the engineer. The cost of this work shall be paid as “Sediment Removal” or “Silt Fence”.

The silt fence shall remain in place until the engineer directs it be removed. Upon removal the contractor shall remove and dispose of any excess sediment accumulations, dress the area to give it a pleasing appearance, and vegetate all bare areas. Removed silt fence may be used at other locations provided the geotextile and other material requirements continue to be met to the satisfaction of the engineer.

642.7 - METHOD OF MEASUREMENT:

DELETE THE FIFTH PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Ditch checks will be measured by the unit.

Dewatering Device will be paid per each device used.

642.9 - PAY ITEMS:

ADD THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
642050-*	Dewatering Device	Each

* Sequence number

ADD THE FOLLOWING SECTION:

SECTION 645
REINFORCED SOIL SLOPES

645.1 - DESCRIPTION:

The following are specification guidelines for Reinforced Soil Slope **(RSS)** construction. Work shall consist of constructing the proposed **RSS** as specified and furnishing all materials for use in construction of reinforced soil slopes. The minimum length of the soil reinforcing as measured from the slope face to the back of the soil stabilized mass, is as shown in the plans. Any staged or temporary construction affecting the **RSS** stability shall be the responsibility of the Contractor.

The Engineer shall approve the geosynthetic material and supplier.

645.2 - MATERIALS:

645.2.1 - Geosynthetics Soil Reinforcing: Cutting of geosynthetic reinforcing longitudinal to the Slope face or at vertical obstacles shall not be permitted. End to End splicing of geosynthetic material will not be permitted.

The geosynthetic used shall meet the minimum requirements shown on the plans. Each roll of geosynthetic material shall be labeled as to its properties. Geosynthetics shall be made of polypropylene, high-density polyethylene or high-tenacity polyester fibers having cross-sections sufficient to permit significant mechanical interlock with the soil/backfill. Geosynthetics shall have a high tensile modulus in relation to the soil/backfill. Geosynthetics shall have a high resistance to deformation under sustained long term design loads while in service and resistant to ultraviolet degradation, to damage under normal construction practices and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

Store the geosynthetics in conditions above 20º F [-7º C] and not greater than 140º F [60º C]. Prevent mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the geosynthetic material. Rolled geosynthetic may be laid flat or stood on end for storage. Cover the geosynthetic and protect from sunlight prior to placement in the wall system.

Carefully inspect all reinforcement to ensure they are the proper size and free from defects that may impair their strength and durability.

The geosynthetic reinforcement structure shall be dimensionally stable and able to retain its geometry under construction stresses and shall have high resistance to damage during construction. The contractor shall submit a manufacturer's certification that the geosynthetics supplied meets the design criteria shown on the plans, measured in full accordance with all test methods and standards specified. In case of dispute over validity of values, the Engineer can require the contractor to supply test data from an approved laboratory to support the certified values submitted.

The Contractor's submittal's package shall include actual test results for tension/creep, durability/aging, construction damage, pullout, quality control and a copy of the Manufacturers installation procedures. Also included shall be the Long -Term Design Strength **(LTDS)** of the Geosynthetic material with the assumptions used to calculate it. The Manufacturer shall also provide written certification that all resin used to produce the geosynthetic is virgin and classified as high density polyethylene, polypropylene, or high tenacity polyester and is capable of withstanding 150 hours of testing per ASTM D4355 with no measurable reduction in the ultimate tensile strength or the deterioration of the coating of the geosynthetic material. If the geosynthetic material is to be used to wrap the face of the slope then the testing per ASTM D4355 will be 500 hours with no measurable reduction in the ultimate tensile strength or the deterioration of the coating of the geosynthetic material.

The allowable tensile strength shall not exceed 25% of the ultimate tensile strength of the reinforcement used. The **(LTDS)** of geosynthetic reinforcement shall be calculated using the following method.

Property	Method
Tensile Strength	
Ultimate, kN/m	
Geotextiles	ASTM D4595
Geogrids	ASTM D6637
Long-Term Design Strength (Ta), kN/m	FHWA/SA-93-025

Where: $\mathbf{T_a = T_{ult}/\{(RF_{cr})(RF_{id})(RF_{du})\}}$
(as described in FHWA/SA-93-025)

T_{ult}, Ultimate Tensile Strength shall be the minimum average roll value ultimate tensile strength as tested per ASTM D4595 for geotextiles and for geogrids ASTM D6637 with the minimum tested value of the single-rib and multi-rib test.

RF_{cr}, Partial Factor for Creep Rupture, is the ratio of T_{ult} to the creep limited strength determined in accordance with ASTM D5262 and FHWA NHI-00-043. The test results shall be extrapolated for a 100-year design life at 68° F (20° C) per FHWA NHI-00-043. Creep rupture data of a polymer product at a designed temperature is limited to one order of magnitude in extrapolation. Creep rupture data at an elevated temperature can permit an additional order of magnitude in extrapolation with time temperature superposition principals. Creep Rupture limited strength testing is required on representative samples of the finished product for each product proposed for use and not a single component of the geogrid (i.e. polymer strand and / or yarn).

Default values for RF_{cr} are not allowed. If product specific testing is not provided the product shall be rejected for use. However, in no event shall the minimum value for Creep Rupture be less than the following:

MINIMUM VALUES FOR RF_{cr}	
Geosynthetic	**Min RF_{cr}**
High Density Polyethylene (HDPE)	2.65
Polypropylene (PP)	4.50
High Tenacity Polyester (PET)	2.00

RF_{id}, Partial Factor for Installation Damage, shall be determined from construction damage tests for each product proposed for use with project specific representative or more severe backfill and construction techniques. Testing shall be consistent with GRI GG4. A Maximum RF_{id} value shall be used if such testing has not been conducted.

RECOMMENDED VALUES FOR RF_{id}		
Geosynthetic	Min RF_{id}	Max RF_{id}
HDPE uniaxial geogrid	1.20	1.45
PP biaxial geogrid	1.20	1.45
PVC – coated PET geogrid	1.30	1.85
Acrylic – coated PET geogrid	1.30	2.05
Woven geotextiles (PP and PET)	1.40	2.20
Nonwoven geotextiles (PP and PET)	1.40	2.50
Silt – film woven PP geotextiles	1.60	3.00

RF_{du}, Partial Factor for Durability / Aging is the combined partial factor for potential chemical and biological degradation. RF_{du} shall be determined from polymer specific (HDPE and PP as identified by specific gravity and melt flow index and PETP as identified by CEG number and intrinsic viscosity) durability testing covering the range of expected soil environments. Prior to approval by the Engineer, the manufacturer shall submit test results from a minimum of at least four (4) tests conducted in accordance with EPA 9090 at temperatures of 73° and 122° F (23° and 50° C). EPA 9090 test results shall include the following minimum number of leachate types:

pH	**Minimum # of test results**
$3 \leq pH \leq 7$	1
$7 < pH \leq 9$	1
$9 < pH < 11$	1
$11 \leq pH \leq 14$	1

As a minimum, the following tests should be performed for geogrids after immersion in the above-described leachates:

TEST	TEST PROCEDURE	MAX %CHANGE ALLOWED
Mass per Unit Area	EPA 9090	±1.0
Dimensions	EPA 9090	±1.0
Thickness	ASTM D374C	±5.0
Wide Width Strip Tensile	ASTM D4595	-2.0

2. Composite (flexible/coated) geogrids shall be evaluated based on the durability characteristics of the interior reinforcement polymer. Therefore, any protective coating shall be removed prior to durability testing unless a minimum 40 micron coating thickness is used on flexible geogrids and certified by the manufacturer.
3. For soils of potential concern, as presented below (modified soils shall include lime stabilized soil, cement stabilized soil or concrete), only polymers listed as "no effect" shall be used within or adjacent to (3 feet shortest measurable distance) these soil environments (Ref: Table 28, FHWA/RD-89-186).

SOIL ENVIRONMENT	PETP	PE	PP	PVC
Acid Sulfate Soils	?	NE	?	?
Organic Soils	NE	NE	NE	?
Salt Affected Soils	?	NE	NE	NE
Ferruginous	NE	NE	X	?
Calcareous	X	NE	NE	?
Modified Soils	X	NE	NE	?

NE = No Effect
? = Questionable Use
X = Not Recommended

RF_{du} shall not be less than the recommended minimum values discussed in FHWA/RD-89-186 and listed below:

MINIMUM VALUES FOR RF_{du}					
Products	Aging Reduction factor, RF_{du} – 100 years				
	pH < 3	3 ≤ pH < 5	5 ≤ pH ≤ 8	8 < pH ≤ 9	pH > 9
PET Uncoated Mn < 20,000 40<GEG<50	*	2.0	1.6	2.0	*
PET Coated Mn > 25,000	*	1.3	1.15	1.3	*

GEG<30					
HDPE	1.1	1.1	1.1	1.1	1.1
Polypropylene	1.25	1.25	1.25	1.25	1.25
Geotextiles Mn < 20,000 40<GEG<50	*	2.0	1.6	2.0	*
* use of materials in this pH range is not recommended but can be used if product specific testing is done.					

645.2.2 - Backfill Material: All backfill material used in the structure volume shall be reasonably free from organic or otherwise deleterious materials and shall conform to the following gradation limits as determined by **AASHTO T-27**:

Sieve Size	**Percent Passing**
100 mm (4 in.)	100
No. 4	100 - 30
No. 20	0 – 60
No. 200	0 – 50

Plasticity Index (PI) ≤ 20 (AASHTO T-90)

A. **Backfill pH Testing**
The contractor prior to incorporating the soil into the RSS shall perform one pH test in each soil type each day of operation and the pH of the soil shall be within the allowable limits of the design for the geosynthetic material used.

B. **Payment**
Payment for the backfill will be incidental to the various excavation items.

CONSTRUCTION METHODS

645.3 - FOUNDATION PREPARATION:

All areas immediately beneath the installation area for the geosynthetic reinforcement shall be properly prepared for a width equal to the length of reinforcement elements plus one 3 ft (1m) or as detailed on the plans or as directed by the Engineer. The surface shall be level, free from deleterious materials, loose, or otherwise unsuitable soils. Prior to placement of Geosynthetic reinforcement, foundation shall be proof-rolled to provide a uniform and firm surface. Any soft areas, as determined by the Engineer, shall be removed and replaced with backfill as per Section 207 of these specifications. Foundation surface shall be inspected and approved by the Engineer prior to fill placement.

Benching the backcut into competent soil is recommended to improve stability. The backslope shall not be steeper than 1.5:1 (1:1.5).

645.4 - GEOSYNTHETIC INSTALLATION:

A representative of the geosynthetic supplier shall be present a minimum of three (3) days and as required thereafter during construction of the reinforced slope to assist the Contractor and Engineer. The cost of the representative shall be considered incidental to the unit cost of the geosynthetic reinforcement.

Geosynthetic reinforcement shall be placed horizontally unless otherwise shown in the plans. Prior to placement of the geosynthetic reinforcements, backfill shall be compacted in accordance with these specifications.

645.5 - BACKFILL PLACEMENT:

Backfill placement shall closely follow the installation of each geosynthetic reinforcement layer. Backfill shall be placed in such a manner as to minimize the development of wrinkles in and/or movement of the geosynthetic material. A minimum fill thickness of 6 inches (150 mm) is required prior to the operation of tracked vehicles over the geosynthetic reinforcement.

Turning of vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geosynthetic. Rubber tired equipment may pass over the geosynthetic reinforcement at low speeds provided that no sharp turns are made. Geosynthetic material damaged during installation shall be replaced by the Contractor at no additional cost.

The maximum lift thickness after compaction shall not exceed 6 inches (150 mm), The Contractor shall decrease this lift thickness, if necessary to obtain the specified density.

Acceptance for compaction shall be in accordance with Section 626.5.3.4. The moisture content of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall have placement moisture content as per Section 716.3.

At the end of each day's operation, the Contractor shall slope the last level of the backfill away from the slope to rapidly direct runoff away from the slope face and construction area. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the reinforced soil slope construction site.

645.6 - EROSION CONTROL MATERIAL PLACEMENT:

The erosion control material shall be placed and anchored on a smooth graded, firm surface approved by the Engineer. Anchoring terminal ends of the erosion control material shall be accomplished through use of key trenches. The material in the trenches shall be anchored to the soil maximum 2 ft (0.5 m) centers. The erosion control material shall meet the specifications of section 715.24.

645.7 - ACCEPTANCE:

The Contractor shall furnish the Engineer a Certificate of Compliance certifying the above materials, excluding backfill, comply with the applicable

contract specifications. A copy of all test results performed by the Contractor necessary to assure contract compliance shall also be furnished to the Engineer.

The backfill shall be in accordance with 626.5.3.4.

645.8 - METHOD OF MEASUREMENT:

The pay items shall be measured in square yards (meters) geosynthetic reinforcement as determined by the dimensions in the plans. No adjustment of pay quantity shall be allowed for changes in Reinforced Soil Slope design to facilitate the Contractor's methods of construction or geosynthetic type used.

Any adjustments to the required amount of embankment backfill due to the particular geosynthetic reinforcement proposed by the contractor shall be considered incidental to the project. No separate payment shall be made for increased embankment backfill requirements. The contractor shall be responsible for any of the cost of changes in waste, borrow, or earthwork quantities from those shown in the plans caused by the requirements of the geosynthetic reinforcement.

645.9 - BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract price per unit of measurement, respectively, for each pay item listed below and shown in the bid schedule, which prices and payment will be full compensation for the work prescribed in this section.

645.10 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
645001-*	"type" REINFORCEMENT, "Long-term design strength" LB/FT (KN/M)	Square Yard (meter)

* Sequence number
"type" Primary or Secondary

SECTION 651
FURNISHING AND PLACING TOPSOIL

651.2 - MATERIALS:

DELETE THE LAST SENTENCE AND INSERT THE FOLLOWING:

Acceptable topsoil shall contain organic matter in the range of 1.5% to 20%.

SECTION 652
SEEDING AND MULCHING

652.6.1 - General:

DELETE THE THIRD PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

When using straw mulch, the mulch shall be anchored with an acceptable binder as described in Section 652.6.2 below. The sequence of application, when using straw mulch shall be as follows: (1) Seed and fertilizer shall be sown prior to mulching. (2) Mulch and mulch binder shall be placed within 24 hours of sowing seed.

SECTION 653
VINE AND GROUND COVER PLANTING

653.9 - PAY ITEMS:

DELETE THE SECTION AN INSERT THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
653001-*	VINES, FAST GROWING, “scientific name”	Each
653002-*	VINES, MEDIUM GROWING, “scientific name”	Each
653003-*	VINES, CLUMP TYPE, “scientific name”	Each
653004-*	GROUND COVERS, “scientific name”	Each
653005-*	WATER FOR PLANTS	Thousand Gallon (Liter)

* Sequence Number

SECTION 654
TREE AND SHRUB PLANTING

654.17 - PAY ITEMS:

DELETE THE SECTION AN INSERT THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
654001-*	TREE, DECIDUOUS, “scientific name”	Each
654002-*	TREE, ORNAMENTAL FLOWERING, “scientific name”	Each
654003-*	SHRUB, DECIDUOUS, “scientific name”	Each
654004-*	SHRUB, EVERGREEN, “scientific name”	Each

654005-*	TREE, EVERGREEN, “scientific name”	Each
654006-*	WATER FOR PLANTS	Thousand Gallon (Liter)

* Sequence Number

SECTION 656
SEEDLING PLANTING

656.8 - PAY ITEMS:

DELETE THE SECTION AN INSERT THE FOLLOWING:

ITEM	DESCRIPTION	UNIT
656001-*	SEEDLING, “scientific name”	EACH

* Sequence Number

SECTION 657
ROADSIDE SIGN SUPPORTS

657.2.2.9 – Anchor Bolts:

DELETE THE SECOND SENTENCE AND SUBSTITUTE THE FOLLOWING:

Anchor bolts (unless otherwise directed on the Plans) shall be fabricated from high strength steel, meeting the requirements specified in ASTM F 1554, Grade 55.

SECTION 658
OVERHEAD SIGN STRUCTURES

658.2.2.1 – Galvanized Steel:

IN THE SECOND SENTENCE OF THE EIGHTH PARAGRAPH, CHANGE ASTM A1554, GR. 105 TO ASTM F 1554, GRADE 105.

658.2.2.2 - Weathering Steel:

DELETE THE FIRST PARAGRAPH AND REPLACE WITH THE FOLLOWING:

All components of the overhead sign supports including miscellaneous fixtures, shall be fabricated from plates, bars, standard W, M, and S shapes produced from steel conforming to AASHTO M270, Grade 50W T-2, and tubes produced from steel conforming to ASTM A 618, Grade 1 with AASHTO M270 supplementary section S83, zone 2 toughness requirements.

SECTION 662
ROADWAY LIGHTING

662.2.13 – Lighting Supports:

662.2.13.1 – Lighting Pole Type I, II, and III-Steel:

662.2.13.1.1 – General Description:

DELETE THE SECOND PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Lighting Poles Type I, II, and III shall be certified to equal or exceed the requirements of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", based on at least 90 mph (145 km/hr) wind loads, a luminaire weight of 50 lb. (22.7 kg) and a luminaire projected area of 1.1 sq ft (0.1 sq m).

662.2.13.1.5 - Bases:

DELETE THE LAST SENTENCE IN THE FOURTH PARAGRAPH AND INSERT THE FOLLOWING:

When aluminum transformer bases are used with unpainted weathering steel poles and bases, both the bottom of the steel anchor base and the top of the aluminum transformer base shall be coated with a heavy film of zinc-rich paint.

662.2.13.1.6 – Anchor Bolts:

IN THE SECOND SENTENCE, CHANGE ASTM A1444 GR.55 TO ASTM F 1554, GRADE 55.

662.2.13.3 – Lighting Pole Type V and VII – Aluminum:

662.2.13.3.1 – General Description:

DELETE THE SECOND PARAGRAPH AND SUBSTITUE THE FOLLOWING:

Lighting Poles Type V and VII shall be certified to be equal or exceed the requirements of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals". Type V shall be based on at least 90 mph (145 km/hr) wind loads, a luminaire weight of 50 lb. (22.7 kg) and a luminaire projected area of 1.1 sq. feet (0.1 sq. m). Type VII shall be based on 90 mph (145 km/hr), ignore the weight and 2.5 sq. feet (0232 sq. m).

662.2.13.3.2 – Pole Shaft:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

The pole shaft shall be one-piece, cylindrical, tapered seamless (or one continuous longitudinal weld) tubing which shall have mechanical properties not less than that listed for ASTM B221, B429, B241, Alloy 6061 T-6 or Alloy 6063-T6 after fabrication. Two-piece shafts that assemble by telescoping the upper section over the lower section with a firm tapered fit, may be used for 40, 45, and 50 ft. (12.13, 13.72, and 15.42 meter) mounting heights. Each pole shaft shall have a J-hook wire support inside near the top, a handhole with cover as noted on the Plans (except for transformer bases) and a ground connector near the bottom. Minimum wall thickness (unless otherwise approved by the Engineer) shall be 0.188 inch (4.775 mm) for Type V Poles and 0.125 inch (3.175 mm) for Type VII poles. The top of shaft OD for "Luminaire Post Tope Mounted" shall be 3 inches (75 mm) unless otherwise approved by the Engineer.

662.2.13.3.3 – Luminaire Support Arm:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

The Luminaire Support Arm shall be aluminum pipe or tapered aluminum tubing which shall have the mechanical properties not less than that listed for ASTM B221, B429, B241 Alloy 6061 T-6 or Alloy 6063-T6 after fabrication. A 2 inch (50 mm) slip fitting arrangement shall be provided at the tip of all arms.

662.2.13.3.5 – Anchor Bolts:

IN THE SECOND SENTENCE, CHANGE ASTM A1554 GR.55 TO ASTM F 1554, GRADE 55.

662.2.13.4 – Lighting Pole Type X – Steel High Mast:

662.2.13.4.1 – General Description:

DELETE THE TABLE AFTER THE THIRD PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Wind Velocity	=	90 mph (144.8 km/hr)
Number of Luminaires	=	8
Weight of Luminaires	=	70 lbs. Each (560 lbs. total)
Area of Lumiares	=	2.0 sq. ft Each (16.0 sq. ft. total) (0.18 sq. meter each (1.472 sq. meters total)
Weight of Mounting Head	=	370 lbs. (167.8 kg)
Area of Mounting Head	=	3.5 sq. ft. (0.325 sq. meter)

SECTION 663
PAVEMENT MARKINGS

663.3 – TYPES OF PAVEMENT MARKINGS:

ADD THE FOLLOWING AT THE END OF THIS SUB-SECTION:

663.3.11 – Yield Triangles: Yield Triangles shall be white beaded markings located and dimensioned as shown on the plans.

663.3.12 – Handicapped Symbols: Handicapped symbols shall be white beaded markings located and dimensioned as shown on the plans.

663.3.13 – Bicycle Symbols: Bicycle symbols shall be white beaded markings located and dimensioned as shown on the plans.

663.5.4 – Extruded Thermoplastic Pavement Markings:

DELETE THE ENTIRE SUBSECTION:

663.5.5 – Preformed Traffic Markings:

DELETE THE FIRST SENTENCE AND INSERT THE FOLLOWING:

Preformed traffic markings shall be fabricated to a uniform thickness of not less than 125 mils.

663.5.10 – Glass Beads:

DELETE ALL AFTER THE FIRST PARAGRAPH:

663.8 – PAY ITEMS:

ADD THE FOLLOWING TO THIS SUB-SECTION:

ITEM	DESCRIPTION	UNIT
663008-*	YIELD TRIANGLE, TYPE "type"	Each
663009-*	"symbol type" SYMBOL, TYPE "type"	Each

SECTION 664
TRAFFIC SAFETY DEVICES

664.2 – MATERIALS:

ADD THE FOLLOWING AT THE END OF THIS SECTION:

Reuseable Energy Absorbing Crash Terminal Device (Type I) 715.41.5
Trinity Attenuating Crash Cushion (Type II) 715.41.6

664.3.1.1 - Crash Cushion and Quad Guard Terminal Devices:

CHANGE THE HEADING TO READ AS FOLLOWS:

664.3.1.1 – Crash Cushion, Quad Guard Terminal Devices, Reusable Energy Absorbing Crash Terminal, and Trinity Attenuating Crash Cushion Devices:

SECTION 675
SANITARY SEWERS

675.2 - MATERIALS:

INSERT THE FOLLOWING AFTER THE MATERIAL REQUIREMENTS TABLE:

Quality control testing of the bedding material is the responsibility of the Contractor as specified in 106.1.

In the event any material does not conform to the specified gradation requirements the contractor's written certification shall reflect said nonconformance with quantities thereof. The contractor's gradation data shall be evaluated in accordance with applicable sections of Section 307 except that Table 704.6.2 shall not apply. Gradation limits shall be in accordance with Table 703.4. The certification is to include the results of testing from samples obtained at a minimum frequency of one sample per day of aggregate production or stockpiling or one sample per placement day, sampling from the working face of an existing stockpile.

A revised unit price for calculation purposes will be established based on the delivered quantities and delivered aggregate cost.

ADD THE FOLLOWING SECTION:

SECTION 679
OVERLAYING OF PORTLAND CEMENT CONCRETE BRIDGE DECKS

679.1 - DESCRIPTION:

The work shall consist of furnishing and placing a specialized concrete overlay to a designated grade line. Unless otherwise indicated on the plans, the Contractor may place any one of the specialized overlays allowed by the terms of this specification. Only one type of overlay will be allowed on any one structure.

679.1.1 - Other Work: The following work, as required by the contract plans, may also be performed under the terms of this section:

a) Clean the bridge deck
b) Bridge deck repair
c) Clean exposed reinforcing steel
d) Support and tie reinforcing steel
e) Place slab reconstruction concrete
f) Abutment backwalls and approach slabs repair (same as bridge deck or as shown in the plans.)
g) Hydrodemolition of existing deck surface

679.1.2 - Definitions:

679.1.2.1 - Specialized Concrete Overlay: Two types of specialized concrete overlay are permitted as follows:

1) **Latex Modified Concrete:** A Portland cement concrete to which an approved styrene butadiene latex admixture has been added.

2) **Microsilica Concrete:** A Portland cement concrete to which an approved Microsilica admixture has been added.

679.1.2.2 - Slab Reconstruction Concrete: Slab reconstruction concrete is that concrete placed completely around exposed reinforcing bars.

679.1.2.3 - Curing Hour: A curing hour is any hour, beginning with the hour of placement, during which the ambient air temperature at the concrete surface remains at, or above, 45° F (7° C) as measured by a recording thermometer.

679.1.2.4 - Curing Temperature: This is the air temperature at the concrete surface, or the air temperature between the concrete surface and its protective covering.

679.2 - MATERIALS:

679.2.1 - General: Materials used in the manufacture of specialized concrete overlays shall meet the requirements specified in Section 601.2 of the Specifications and as required herein.

679.2.1.1 - Fine Aggregate: Fine aggregate shall be silica sand meeting the requirements of Sections 702.1.2 through 702.1.5 and 702.6 of the Specifications.

679.2.1.2 - Coarse Aggregate: Coarse aggregate shall be AASHTO Size No. 8 crushed stone or gravel conforming to Section 703 of the Specifications.

679.2.1.3 - Latex Admixture: Formulated latex modifier shall meet the requirements of Section 707.5 of the Standard Specifications.

679.2.1.4 - Microsilica Admixture: Microsilica Admixture shall meet the requirements of Section 707.4.3 of the Standard Specifications.

679.2.1.5 - Bonding Grout: Bonding Grout shall consist of the actual modified concrete being used, with the coarse aggregates removed, mixed with sufficient water to form a slurry. The consistency of the slurry shall be such that it can be applied to the prepared concrete surfaces with a stiff bristle broom in a thin, even coating that will not run or puddle. The bonding grout shall be applied using a stiff broom and worked into all areas of the slab.

679.2.1.6 - Class K Concrete: Class K Concrete shall meet the requirements of Section 601 of the Specifications except that coarse aggregate shall meet the requirements of 679.2.1.2.

679.2.1.7 - Curing Materials:

Burlap: This shall meet the requirements of Section 707.7 of the Specifications.

Quilted Covers: These shall be clean and free of defects, providing a water retention blanket over the concrete. Acceptance will be based on visual inspection.

Polyethylene Curing Covers: These shall meet the requirements of Section 707.6 of the Specifications.

Plastic Coated Fiber Blankets: These shall be clean and free of defects, providing a water retention blanket over the concrete. Acceptance will be based on visual inspection.

679.2.1.8 - Replacement Bars: Reinforcing bars shall be Grade 60 and shall meet the material requirements of Section 602 of the Specifications. Replacement bars shall be spliced to existing bars using either minimum 30-bar diameter lap splices or approved mechanical connectors.

679.2.2 - Specialized Concrete Mix Design and Testing: Specialized concrete shall consist of a homogeneous mixture of cement, fine aggregate, coarse aggregate, latex or microsilica admixture, chemical admixtures and water.

The Contractor shall determine mixture proportions in general accordance with ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete." Establishment of mixture proportions shall be coordinated with the manufacturer of the latex or microsilica admixture.

Design mixture testing shall include air content, slump, and compressive strength results at 28 days and results of rapid chloride permeability tests. For establishment of mixture proportions, rapid chloride permeability tests shall be made on representative samples cured for 28 days in accordance with ASTM C31, then prepared and tested in accordance with AASHTO T277 at an age of 35 to 42 days. The results of this test should not exceed 750 coulombs.

The 28-day compressive strength of the test mix that satisfies the 750 coulomb threshold shall be used as the basis for acceptance of the Specialized Concrete Overlay permeability requirements. Concrete for any slump test shall be deposited in a manner and location that excludes the effects of vibrations caused by traffic and concrete placement operations.

The total concrete constituents shall contribute less than 0.10% water soluble chloride ion by weight of cement. Use one brand and/or one source for any concrete constituent.

The Contractor shall obtain a written statement from the manufacturer of the latex or microsilica admixture that confirms the compatibility of the material combination and the sequence in which they are combined. The written statement, along with the results of all required tests, shall be furnished to the Engineer prior to the pre-construction meeting (refer to 679.2.2.3). Substantiating data showing compliance with the requirements of this specification shall also be submitted. This data shall also include the sources of coarse and fine aggregates as well as the brands of all admixtures to be used.

679.2.2.1 - Latex Modified Concrete: The following test criteria must be met for all latex modified concrete pours placed at the structure. This testing shall be performed by the Contractor or his designated representative and certified results provided to the Engineer prior to final acceptance of the project.

Chloride Permeability (a)	1000 coulombs @ 90 days, maximum (per AASHTO T277)
Compressive Strength,(b)	not less than 80% of 28-day compressive strength of the approved test mix
Water/(Cement + fly ash) Ratio (c)	0.40 by weight, maximum

Portland Cement Content (d)	658 lb/cu. yd., minimum (390 kg/m³, minimum)
Latex Admixture Content (e)	24.5 gal/cu. yd., minimum (121 liters/m³, minimum)
Air Content (f)	6.5% maximum (Per AASHTO T152)
Slump	4.0 inches ± 2.0 inches (100 mm ± 50 mm)

- Note (a) Chloride permeability test shall be performed and the results tabulated and submitted to the Engineer. These results will not be used for acceptance provided the compressive strength requirements are satisfied.
- Note (b) The minimum compressive strength for the overlay concrete shall be 80% of the 28-day compressive strength of the approved test mix. However, the minimum 28-day compressive strength shall be 4,000 psi (28 Mpa). Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense.
- Note (c) The amount of added water shall be adjusted to provide slump at or below the prescribed limit. The water portion of all admixtures shall be included as part of the water/cement ratio.
- Note (d) An equal volume of fly ash may be substituted for cement to a maximum of 1 ¼ bags per cubic yard (meter). When fly ash is used, equivalent volumes of fly ash shall be considered as cement for purposes of determining the proportioning ratios.
- Note (e) Latex sampling shall be in accordance with 707.5.
- Note (f) The initial mix design shall be based on an expected air content range of 3% to 6%. The mixture proportions shall be determined using actual conditions for fineness modulus and bulk specific gravities (saturated surface dry for aggregates).

679.2.2.2 - Microsilica Concrete: The following test criteria must be met for all microsilica concrete pours placed at the structure. This testing shall be performed by the Contractor or his designated representative and certified results provided to the Engineer prior to final acceptance of the project.

Chloride Permeability (a)	1000 coulombs @ 90 days, maximum (per AASHTO T277)
Compressive Strength,(b)	not less than 80% of 28-day compressive strength of the approved test mix
Water/(Cement + microsilica + fly ash) Ratio (c)	0.37 by weight, maximum
Portland Cement Content (d)	680 lb/cu.yd., minimum (404 kg/m³, minimum)
Microsilica Content (e) (Dry Weight)	50 lb./cu. Yd., minimum (30 kg/m³, minimum)
Air Content	7.0% (plus or minus 1.5%) (Per AASHTO T152)
Slump	6.5 inches ± 1.5 inches (165 mm ± 40 mm)
High Range Water Reducer(Superplasticizers) (f)	As needed for workability, slump and water/cementitious ratios

- Note (a) Chloride permeability test shall be performed and the results tabulated and submitted to the Engineer. These results will not be used for acceptance provided the compressive strength requirements are satisfied.
- Note (b) The minimum compressive strength for the overlay concrete shall be 80% of the 28-day compressive strength of the approved test mix. However, the minimum 28-day compressive strength shall be 4,000 psi (28 Mpa). Overlay concrete with a compressive strength of less than this acceptance level may be removed and replaced at the contractor's expense.
- Note (c) The amount of added water shall be adjusted to provide slump at or below the prescribed limit. The water portion of all admixtures shall be included as part of the water/cement ratio.
- Note (d) An equal volume of fly ash may be substituted for cement to a maximum of 1 ¼ bags per cubic yard. When fly ash is used, equivalent volumes of fly ash shall be considered as cement for purposes of determining the proportioning ratios.
- Note (e)Microsilica sampling shall be in accordance with 707.4.3.
- Note (f) A high range water-reducing admixture is required to improve workability. No more than two additions of the admixture shall be made, and the total quantity shall not exceed the manufacturer's maximum dosage rate. Each time high range water reducer is added, the concrete shall be mixed an additional minimum of 30 revolutions. The total number of revolutions shall not exceed 300.

679.2.2.3 - Pre-Pour Meeting: The Contractor shall schedule a meeting prior to the start of the concrete work. The Engineer, Construction Manager, Prime Contractor, Concrete Contractor, Concrete Finisher, and the Concrete Supplier shall attend. Topics of discussion shall include specialized concrete mixture proportions, batching, transporting, handling, placing, finishing and curing.

679.2.2.4 - Test Slab Requirements: After obtaining the Engineer's approval of mixture proportions and at least one week before any slab reconstruction concreting or overlay is to be placed, the Contractor shall make one or more trial batches of the specialized concrete of the size to be hauled or mixed at the site. The trial shall simulate transportation and job site conditions, utilizing proposed material and methods of placing, finishing and curing. The test slab shall be constructed the same as the actual work (depth, reinforcing steel, etc.) and shall be at least one lane width wide and of a length to allow the use of the contractor's entire paving train from placement to finishing. The test slab location shall be as shown in the plans or as approved by the Engineer. The prime intent is to familiarize the concrete finishing crew with the handling, finishing and curing characteristics of the concrete. Batching, placement and texturing shall be in strict accordance with this specification. Additional reference test slabs may be constructed as necessary to provide an acceptable standard of reference. This standard of reference shall serve throughout the project construction period as the basis of acceptance of the actual as-built work. This Item may be deleted at the discretion of the Engineer.

679.2.3 - Equipment: All equipment proposed for use shall have the Engineer's approval prior to its usage.

679.2.3.1 - Cutting Equipment: Shall consist of a high pressure water jet (hydrodemolishing) system per the following requirements.

679.2.3.1.1 - Hydrodemolishing Equipment: The hydro- demolishing system shall be self-propelled, completely programmable, designed for high production concrete removal, and capable of removing precise depths of sound concrete. Hydrodemolishers shall be capable of removing concrete from around and below the steel reinforcement. Lances shall be of a type intended to remove rather than scarify concrete. Individuals certified by the equipment manufacturers shall operate the removal equipment.

All removal equipment shall be capable of operating at a noise level of less than 90 decibels at a distance of 50 feet (15 m) from the noise source. The Contractor shall monitor noise levels throughout the project to insure compliance, if required by the Engineer. No separate or additional payment will be made for monitoring -noise levels.

Potable or filtered water may be used. Filtered water shall have all visible solids and oils removed that could prevent a proper bonding with the remaining concrete. When filtered water is used, the Contractor shall wash the bridge deck with potable water in water blasting equipment as soon as all the concrete debris have been cleaned up. This water blasting shall be in addition to any other water blasting that may be required.

The Contractor shall shield his operations to prevent injury or damage from flying or falling debris. The Contractor shall provide a method for handling expected and unexpected blow-through of the deck. This method shall provide for the containment of runoff water and debris, and the protection of the area under the bridge deck. The Contractor shall be responsible for any injury or damage caused by his operations.

679.2.3.1.2 - Hydrodemolishing Equipment Demonstration: Two trial areas will be designated by the Engineer to allow the Contractor to demonstrate that the equipment, personnel, and methods of operation can meet the requirements of this specification. The demonstration shall follow any roto-milling permitted by this specification. No separate or additional payment will be made for this demonstration.

The first trial area will consist of approximately 30 square feet (9 m^2) of sound concrete. The hydrodemolisher shall be calibrated to remove sound concrete to the depth specified in the contract documents without damaging the underlying sound concrete. After removing the sound concrete in the first trial area, the hydrodemolisher shall be moved to the second trial area. This area will consist of deteriorated or defective concrete. This trial will determine whether this unsound concrete will be completely removed with the above calibration.

If the equipment is deemed inadequate for use, the Contractor shall obtain another hydrodemolisher for a subsequent demonstration. When satisfactory results are obtained, production removal may proceed. No adjustment in the completion date of the project will be considered due to delays in obtaining suitable equipment.

If concrete is not being adequately removed during production work, recalibration of the equipment will be required.

679.2.3.2 - Blastcleaning Equipment: Blastcleaning Equipment shall be capable of removing rust from reinforcing bars, laitance, and small chips of partially loosened concrete. Certain qualities of rust are not necessary to be removed (refer to Section 679.3.3).

679.2.3.3 - Proportioning and Mixing Equipment: Handling, Measuring, and Batching of materials shall conform to the requirements specified in 501.7.

Proportioning and Mixing Equipment shall consist of the following:

679.2.3.3.1 - Latex Modified Concrete: Self-contained, continuous mixing and proportioning mobile units shall be used. A minimum of two units shall be supplied. The requirements of Sections 679.2.3.4 and 679.2.3.5 shall apply.

679.2.3.3.2 - Microsilica Concrete: An approved concrete batch plant, mobile mixer or truck mixer shall supply all concrete. The requirements of Section 601 of the Specifications shall apply, except as modified herein.

When microsilica densified powder is used, the densified powder shall be weighed using an approved cement scale or supplied in bags, the weight of each bag shall be clearly marked on the bag. The densified powder shall be last in the weighing sequence and the tolerance for each material draw weight shall be based upon the total weight of cement plus densified powder. Batching tolerance for the cement plus densified powder shall be 0.5%.

When microsilica slurry is used, the slurry shall be added prior to the initiation of the batching sequence using calibrated proportioning equipment approved by the Engineer. Batching tolerance of the slurry shall be 2%.

679.2.3.4 - Mobile Mixer Units: Each unit shall be self-propelled and shall be capable of carrying sufficient unmixed material to produce on site, no less than 6 cubic yards (4.5 cubic meters) of specialized concrete.

The Engineer will inspect each unit. A unit not functioning in a manner the Engineer considers acceptable shall be repaired. If repair is impractical, the unit shall be replaced. All costs associated with delays attributable to mobile mixer replacement shall be borne by the Contractor. No extension of time, for the purpose of replacing unacceptable mixers, will be granted. Conditions which will automatically designate a unit unacceptable are: hydrated cement deposits; broken, bent, loose or scalloped mixing paddles; mixing paddles worn 20% in any dimension; mixing paddles heavily caked with mortar; and admixture or water delivery system out of tolerance.

Proportioning devices shall deliver the materials within the following tolerances:

Coarse Aggregate	2%
Fine Aggregate	2%
Cement + fly ash	0% to 4 %
Water	2%
Cement + microsilica powder	0.5%
Microsilica Slurry	2%
Latex Admixture	1%
Other Admixtures	3%

The unit shall be capable of positive measurement of cement being introduced into the mix.

There shall be positive control of the flow of water into the mixing chamber. Water flow shall be indicated by a flowmeter and readily adjustable to provide for minor variations in aggregate moisture. The system shall be equipped with a bypass valve, or hose, for determining proportioning accurately. Also, there shall be a positive control of the flow of admixture into the mixing chamber. The admixture discharge pipe shall be readily accessible for determining proportioning accuracy.

The units shall be capable of being calibrated to automatically proportion and blend all components of indicated composition on a continuous or intermittent basis as required by the finishing operation, and shall discharge mixed material through a conventional chute directly in front of the finishing machine.

A sufficient number of self-propelled mixers shall be available at the job site to insure that not more than 30 minutes shall elapse between the placement of batches.

679.2.3.5 - Mobile Mixer Unit Testing: The units shall be calibrated by the Contractor to accurately proportion the approved mix design prior to placing the mix. The Engineer may require recalibration of any mixer as deemed necessary. Yield tests shall be performed by the Contractor for each mixer for each day's operation and when there appears to be a change in the mix. Certification of the calibration by an approved testing authority will be accepted as evidence of this accuracy if the yield is shown to be true within a tolerance of 1.0% according to the following test:

With the cement yard set on zero and all controls set for the approved design mix, activate the mixer and discharge mixed material into a 0.25 cubic yard (meter) container 1 yard (meter) square by 9 inches (250 mm) tall. When the container is level-struck full, making provision for settling the material into all corners, the cement yard shall show the discharge for a 0.25 cubic yard (meter) pour within the tolerance specified (refer to 679.2.3.4). No calibration shall be performed while it is raining.

679.2.3.6 - Placing and Finishing Equipment: This shall include adequate hand tools for the placement of plastic concrete and for working down to approximately the correct level for the auger strike-off. A self-propelled finishing machine will be required to place and finish all concrete, except in areas inaccessible to the machine.

The finishing machine shall be capable of forward and reverse motion under positive control. Provisions shall be made for raising the screeds to clear the screeded surface, if traveling in reverse.

The machine shall be capable of placing full width, in one operation, the pours shown in the plans. The finishing machine shall be equipped with a vibrating device to consolidate the concrete, a power driven strike-off auger, a power driven finishing roller, and a pan float. The vibrating device shall vibrate at a frequency between 50 Hz and 115 Hz. A sufficient number of suitable portable lightweight or wheeled work bridges shall be required and used behind the finishing operation for touch-up work, surface texturing and curing cover placement.

Approved manual type screeds, metal plates equipped with electric vibrators, or hand held vibrators shall be used to consolidate and finish small inaccessible areas and slab reconstruction concrete.

Supporting rails shall be required. Rails may be two inch by 2 inch (50 mm) perforated steel bar stock, 2 inch (50 mm) pipe rail, or approved equal. They shall exhibit no bends or kinks. Rail supports shall be fully adjustable (not shimmed) to obtain the correct profile. Rail supports are subject to the requirements of 679.3.7.2.

When placing concrete adjacent to a previously completed pour, the side of the finishing machine adjacent to the completed pour shall be equipped to travel on the completed lane on rail supports only.

The placing and finishing equipment shall be designed so that the elapsed time between depositing concrete and final finishing shall not exceed 10 minutes.

679.2.3.7 - Recording Thermometer: The Contractor shall supply a continuous recording thermometer capable of recording temperatures in the 30 - 100° F (2 - 30° C) range. It shall likewise provide a recording capability over a 24-hour continuous period, minimum. The Contractor shall provide any ancillary equipment, supplies and labor necessary for calibration of this equipment.

679.2.3.8 - Compressors Or Water Flushing Equipment: Equipment used for surface preparation shall be of such size and capacity to thoroughly remove all foreign material from the surface being prepared.

679.2.3.9 - Saw Cutting Equipment: Only multi-bladed saw cutting equipment, using circular saw blades, will be permitted for final deck finish operations. The Engineer may allow the use of single blade circular saw equipment only where such equipment is necessary to complete the work as required.

679.2.3.10 - Fogging Equipment: Fogging equipment shall be available for use in accordance with these specifications. The fogging nozzles shall produce an atomized mist. Fogging nozzles shall incorporate compressed air to create the mist. Hand held or hand operated equipment shall be permitted when the Contractor has demonstrated that his operator has been trained in its use.

679.3 - CONSTRUCTION METHODS:

679.3.1 - Removal of Existing Deck Surface: Prior to concrete deck removal operations, asphaltic patches or bituminous overlays shall be removed by hydrodemolishing, roto-milling, or other approved methods. All debris from patch or overlay removal shall be legally disposed.

To facilitate hydrodemolishing, up to one half of the total depth of concrete to be removed may be removed using roto-milling machines. If the Contractor chooses to use roto-milling, he shall determine the depth to the top mat of reinforcing steel using methods acceptable to the Engineer. The roto-milling operation shall be conducted in a manner that does not damage the existing reinforcing mats. If in the judgment of the Engineer the reinforcing mat is being damaged the remainder of the deck removal shall be by hydrodemolishing.

One pass of the hydrodemolisher shall be made to remove all concrete within the limits shown and to the depth specified in the contract documents. Care shall be exercised to avoid removing sound concrete beyond the specified depth.

Following the first pass of concrete deck removal, the Contractor shall sound the deck using chain drags and outline remaining areas of delaminated and unsound concrete for removal subject to the approval of the Engineer. Aerosol spray paint for outlining shall be provided by the Contractor. Edges around these concrete removal areas shall be vertical or slightly undercut. A second pass of the hydrodemolisher shall be made to remove the above concrete.

During the second pass, lances may be substituted for the hydrodemolisher in areas inaccessible or otherwise inconvenient to hydrodemolishing. Chipping hammers will be permitted by the Engineer only in areas demonstrated by the Contractor to be inaccessible to the hydrodemolisher and lances. Chipping hammers shall weigh less than 30 pounds and only chisel bits shall be used. Chipping hammers heavier than the nominal 15-pound (6.5-kilogram) class shall not be used to remove concrete from beneath any reinforcing bar.

Debris shall be removed directly following any concrete removal operations. Removal of debris shall be accomplished by hand and vacuum methods. All debris shall become the property of the Contractor and shall be legally disposed. The Contractor shall exercise care to avoid damage to the remaining concrete or exposed reinforcement.

The Contractor shall provide for the collection and disposal of all runoff water generated by the removal process. The Contractor shall obtain all required permits and shall comply with applicable local, state, and federal regulations concerning such water disposal. The Contractor shall make provision for the safe handling of runoff water insofar as it may constitute a physical hazard on the adjacent or underlying traveled roadway surface.

Water will not be allowed to enter storm sewers, bridge drainage, downspouts, fingerdams, or any other drainage area of the deck surface. The Contractor shall exercise care to protect existing berm slopes from scouring by water jets or runoff water.

The Contractor shall provide adequate lighting to allow for the safe conduct of night removal operations, and shall obtain the Engineer's approval for same, exercising care to avoid any hazardous glare in the direction of oncoming traffic.

When a bridge deck has an asphalt overlay, the stated depth of removal shall be measured from the bottom of the asphalt overlay.

When full depth removal is necessary, the forming shall be performed in accordance with Sections 104.3 and 109.4 of the Specifications.

679.3.2 – Removal of Newly Placed Deck Surface: The finished deck surface shall be shotblasted in preparation for a mechanically bonded surface. Shotblasting shall remove the upper surface of the deck to the satisfaction of the engineer. This may require approximately 1/8 inch to ¼ inch (3 to 6 mm) of the concrete to be removed. In all cases the surface laitance shall be removed to provide a solid profile on which to bond the overlay. The cost of shot-blasting of the concrete deck shall be considered incidental to the Specialized Concrete Overlay.

679.3.3 - Preparation of Surface: Blastcleaning shall be performed to thoroughly clean all horizontal and vertical receiving surfaces. Surfaces, which will be in contact with the specialized concrete overlay, shall have laitance and partially loosened chips of concrete removed by blastcleaning, which shall produce a bright, clean appearance. The edge of previously placed pours shall be similarly treated to promote bond.

All reinforcing steel, or other steel, which is to be in contact with the new concrete, shall be cleaned of all grease, dirt, concrete mortar and injurious rust. Injurious rust is defined as all scale, loose rust deposits, or all rust not firmly bonded to steel. Rust and concrete deposits, which in the Engineer's opinion cannot be removed by blastcleaning, will be considered firmly bonded and may remain. Any portion of a reinforcing bar judged by the Engineer to have any more than 50% section loss shall be replaced at no additional cost to the Division. A light coating of orange colored rust that forms on the reinforcing steel after blast cleaning is not considered detrimental to bond and may remain unless the time limit that follows is exceeded, or if ordered to be removed by the Engineer.

All debris from the blastcleaning operation shall be removed. After removal, the exposed reinforcing steel shall be supported and tied. Rustproof chairs shall be provided. If a continuous length of 6 ft. (1.8 m) or more of reinforcing bar is exposed, the Engineer may require supports and positive tie-downs at a maximum spacing of 4 ft. (1.2 m). Positive tie-downs shall consist of anchors drilled into the structural slab and connected to the reinforcing bars. Replacement bars shall be spliced to existing bars using either minimum 30 bar diameter lap splices, approved mechanical connectors, or a welded splice as directed by the Engineer. Welded splices, if approved, shall be in accordance with ANSI/AWS Structural Welding Code - Reinforcing Steel D1.4. The Engineer shall be allowed sufficient time to inspect the work after the supporting and tying of the reinforcing steel has been completed.

Blastcleaning operations may be commenced in an area after necessary concrete removal, per Section 679.3.1 or Section 679.3.2, as applicable, has been completed.

If more than 48 hours elapse from the termination of any blastcleaning operation to slab wetting, blastcleaning shall be repeated per the Engineers direction regardless of the apparent condition of the receiving surfaces.

679.3.4 - Structural Slab Wetting: The structural slab surface and any other porous surface, which will be in contact with new concrete, shall be prewetted with water. All standing water in depressions or areas of concrete removal shall be blown out with oil-free compressed air. The surface shall be thoroughly wetted to a saturated condition and shall be visibly moist when placement begins.

679.3.5 - Placement Preconditions: Slab reconstruction concrete, or overlay concrete, shall be placed only after all of the following preconditions are satisfied:

The Contractor has submitted to the Engineer, in writing, the proposed sequence of operations, equipment, number of personnel, and category of personnel to be used during the concrete placement.

a) All concrete removal operations in the placement area are complete and approved.
b) Deck drains have been cleaned of all debris and plugged.
c) Blastcleaning has been completed on an area large enough to require one working day for concrete overlay placement. In no case shall this be less than one span long.
d) Any additional blastcleaning, if required, has been completed and approved on an area large enough to require one working day for concrete overlay placement. In no case shall this be less than one span long.
e) Slab temperature and wetting requirements are met.

679.3.6 - Placing, Finishing and Curing Slab Reconstruction Concrete: Slab reconstruction concrete shall be placed separately from overlay concrete except when both of the following conditions are, in the opinion of the Engineer, present:

a) Areas of exposed reinforcing steel do not exceed 5% of the total slab area ready to be overlayed.
b) Individual areas of exposed reinforcing shall not exceed 25 square feet (7.5 m) in area.

When these two conditions are present, slab reconstruction concrete may be placed integrally with overlay concrete.

The Contractor has the following choices of concrete placed as slab reconstruction concrete:

Overlay Type	Slab Reconstruction Concrete
Latex Modified	Latex Modified or Class K
Microsilica	Microsilica or Class K

Slab reconstruction concrete placed integrally with overlay shall match the Specialized Concrete Overlay.

Bonding grout shall be placed against all vertical surfaces receiving slab reconstruction concrete. The perimeter of these surfaces shall be nearly vertical or slightly undercut.

When Class K Concrete is used as reconstruction concrete, a self-contained mobile mixer meeting the requirements of 679.2.3.4 may be used to provide the concrete.

After blastcleaning is completed, the Contractor shall place slab reconstruction concrete in the locations where reinforcing bars have been exposed. The concrete shall be consolidated by internal vibration in accordance with Section 601.10.3 of the Specifications. It shall be finished to the level of the surrounding concrete, or to the middle of the reinforcing steel, whichever is higher. The surface of the new concrete shall be intentionally roughened to a raked finish. Placement of slab reconstruction concrete in accordance with this subsection shall not relieve the Contractor of the requirements to provide the minimum required thickness of overlay material.

679.3.6.1 - Slab Reconstruction Concrete Curing Requirements: Curing shall be accomplished in the following manner:

Latex Modified Concrete. Curing shall be performed in accordance with 679.3.7.5.1.

Microsilica and Class K Concrete. Curing shall be by means of quilted covers, or plastic coated fiber blankets. Quilted covers, if used, shall be kept wet for the entire curing period in accordance with 679.3.7.5.2. The wet curing period shall be 72 curing hours.

The use of membrane curing compounds shall not be allowed.

679.3.6.2 - Removal of Slab Reconstruction Concrete Surface: The slab reconstruction concrete surface shall be blastcleaned per the requirements of Section 679.3.3 prior to the placement of the overlay.

679.3.7 - Placing and Finishing Specialized Concrete Overlay:

679.3.7.1 - General: The following requirements shall apply for specialized concrete overlay placements:

a) The normal overlay thickness shall be as shown on the plans. Under any circumstances, the overlay shall not be less than 1 ¼ inches (31 mm).
b) The prepared surface of the structural slab shall be protected from contamination by any source.
c) Concrete may be mixed at the point of deposition.
d) When placing Specialized Concrete Overlays on a newly placed deck, the deck concrete shall be a minimum of 28 days old. The sidewalks, parapets, or curbs shall be a minimum of 7 days old.

679.3.7.2 - Finishing Equipment: Supporting rails upon which the finishing machine travels shall be placed outside the area to be overlayed. Said rails shall be supported at spacings sufficient to prevent any deflections. If deflections occur, support spacings shall be reduced, or rails shall be replaced by more resistant rail material. Anchorage of supporting rails shall provide for horizontal and vertical stability. The Engineer may require positive anchorage. A hold-down device shot

into the prepared surface, or new overlay, will not be permitted. Supporting rails shall not be treated with parting compounds or release agents to facilitate their removal.

Immediately prior to the beginning of overlay operations, the finishing machine shall be operated over the full length of the bridge segment to be overlayed. This test run shall be made with the screed adjustment set to its finishing position. While operating the finishing machine during the test, the screed rails shall be checked for deflection and the minimum overlay thickness confirmed. The clearance shall be checked with the use of 1 ¼ inches (31 mm) thick filler blocks attached to the bottom of the screed during the test run. All necessary corrections shall be made prior to any concrete placement.

679.3.7.3 - Placement: The following requirements shall apply during placement of the Specialized Concrete Overlay:

No concrete shall be placed unless surface slab temperature requirements of 679.4.6 and 679.4.7 are met. So that the use of hand tools will be kept to a minimum, concrete shall be deposited as nearly as possible to its final position. Internal vibrators shall not be used for moving concrete into position.

a) A pencil type vibrator shall be used along all construction joints to further consolidate the concrete to prevent voids.
b) The new concrete shall be placed slightly above final grade. It shall then be struck-off, screeded, and finished to final grade.
c) The finished surface, before texturing, shall be uniformly smooth, dense and even. Variations in pavement surface in excess of 1/8 in. (3 mm) above, or below, the proper finished elevation, or surface irregularities of more than 1/8 in. in 10 feet (3 mm in 3 m), will not be accepted.
d) At transverse and longitudinal construction joints, the overlay placement shall be continued beyond the joint location a distance at least equal to the placement depth, and shall be allowed to stand free or shall be formed. After the overlay has cured, the concrete shall be sawed to a depth of ¾ in. ± 1/8 in. (19 mm ± 3 mm). The overlay material beyond the saw cut shall be chipped out to the level of the original prepared surface, or to the level of the reinforcing bars, whichever is higher. The chipped face of the construction joints shall not undercut the saw cut and shall have a slope of approximately 45°. Chipping hammers shall weigh less than 30 lb. (15 kg), and only chisel bits shall be used.
e) A construction dam, or bulkhead, shall be installed in case of a delay in the placement operations exceeding 30 minutes duration. During any delays of 30 minutes or less, the placement shall be protected from drying with several layers of wet burlap. If the concrete placement is stopped, or delayed, for 90 minutes or more, further placement shall be discontinued and may be resumed only upon the approval of the Engineer. When a placement delay greater than 90 minutes occurs, the Contractor shall saw and seal a control joint in the overlay.
f) Adequate precautions shall be taken to protect freshly placed concrete from rainfall. All placement operations shall stop when it starts to rain. The Engineer may order removal and replacement of material damaged by rainfall in accordance with 679.4.9.
g) The addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted.

679.3.7.4 - Surface Texturing: The surface of the specialized concrete overlay shall be uniformly smooth, dense and even. The surface shall then be given a suitable texture with an approved burlap drag.

The Contractor shall texture in a transverse or longitudinal direction. Once begun, the direction of texturing shall not change. All texturing shall be performed prior to the beginning of curing operations. Only one pass of the drag over the finished area will be permitted. Texturing shall be in strict accordance with the time requirements of 679.3.7.5 for applying wet burlap.

If texturing is done in the transverse direction, the Contractor shall texture by hand methods as soon as practicable after finishing machine passage.

If texturing is done in the longitudinal direction, the burlap drag shall be a seamless strip and shall be attached to the work bridge such that the surface of the concrete is textured as soon as practicable after finishing machine passage. Small areas, inaccessible to the attached drag, may be textured by hand methods.

The finishing movement and resulting progress of the burlap drag shall be done in a manner so as to prevent ridges or gouges from forming in the concrete surface. The drag shall be weighted and the contact area changed as required to produce a texture acceptable to the Engineer. The drag shall be cleaned as required; to remove all hardened concrete particles.

Texture resulting from the drag shall stop within 1 ft. (300 mm) of curbs or parapets.

679.3.7.5 - Curing: It is the nature of specialized concrete overlay material to quickly form a plastic film at the surface upon drying. This film is to be protected from drying and cracking by prompt covering with wet burlap. Regardless of the type of concrete placed, the use of membrane curing compounds will not be allowed. Floor drains shall be immediately unplugged to permit the deck to drain.

The overlay surface shall be completely covered with clean, wet burlap. The burlap shall be thoroughly saturated over its entire area, but shall be drained of excess water before application. Burlap shall be lapped a minimum of 1 ft. (300 mm) and shall lay flat. Failure to apply wet burlap within 10 minutes after the concrete has been placed will be cause for rejection of the work as determined by the Engineer. The Engineer may extend time if the plastic film has not formed or the Contractor's fogging operation adequately protects the film.

679.3.7.5.1 – Curing Latex Modified Concrete: A layer of 4-mil (0.1 mm) thick white polyethylene film shall be placed over the burlap as soon as possible. The overlay shall then be wet cured for 48 curing hours. Care shall be exercised to ensure the burlap remains saturated for the 48-hour cure period. Plastic coated fiber blankets may be substituted for the polyethylene film, but shall not replace the initial wet burlap. The film (or fiber blankets) shall be anchored along all edges and internally to prevent the loss of moisture and from being displaced. After the wet cure, the polyethylene film and burlap shall be removed and the concrete shall be air-cured for 48 hours.

679.3.7.5.2 – Curing Microsilica Concrete: Care shall be exercised to ensure that the burlap is well drained. Burlap shall be continuously wet for a period

of 96 curing hours by means of automatic intermittent sprinkling or a continuous wetting system.

679.4 - CONSTRUCTION LIMITATIONS AND REQUIREMENTS:

679.4.1 - Stockpiling Aggregates: All aggregates shall be stockpiled at the concrete mixing site or another location approved by the Engineer.

Stockpiles shall be completely covered and no additions to approved stockpiles are permitted.

The free moisture content of each aggregate type, at the time of batching, shall not exceed 7% of the saturated-surface dry weight of the fine or coarse aggregate or 8% total for both aggregates.

Fine and coarse aggregates, which are stored in piles or bins, shall be kept entirely separated.

679.4.2 - Storage and Handling of Cement: Suitable provisions shall be made to prevent the loss of cement during handling. Cement to be stored shall be kept in suitable weatherproof enclosures, which will protect the cement from dampness. Cement, which has developed lumps in storage, shall not be used.

679.4.3 - Vehicular and Equipment Restrictions: The operation of vehicles and equipment on or over, the structural slab area where concrete removal operations have been started is subject to the following restrictions:

679.4.3.1 - Vehicle Weight Limits: Vehicular traffic is limited to necessary construction equipment. No vehicle or construction equipment weighing in excess of 7000 lb., (48 Mpa), shall be allowed to operate on, or over, any area of structural slab which exhibits unprotected, fully exposed reinforcing steel.

679.4.3.2 - Runways: Properly supported runways shall be provided where concrete transporting devices operate over exposed reinforcing steel and expansion devices.

679.4.3.3 - Reinforcing Steel Protection: Exposed reinforcing steel shall be protected from concrete transporting devices so that no debonding, loosening, bending, or breaking occurs. Reinforcement that is damaged by any of the Contractor's operations shall be removed and replaced to the satisfaction of the Engineer and at no additional cost to the Division.

679.4.3.4 - Construction Loading Limitations During Curing: No load shall be permitted on new concrete until the specified curing period(s) has been completed. No structural slab concrete removal work shall be performed on structural slab areas adjoining new concrete during the time the new concrete is curing.

679.4.4 - Concrete Placement Limitations: The temperature of the plastic concrete, as discharged from the mobile mixer or delivery unit, shall be at least 50˚F (10˚C) but not more than 85˚F (30˚C). If conditions are such that, in the opinion of the Engineer, these temperature requirements may not be met, the provisions of either Section 601.9.1 or 601.9.2 of the Specifications will apply. If the evaporation rate exceeds 0.10 lb./sq. ft. per hour (see Figure 1), the Contractor shall make provisions (i.e. wind breaks, fogging, etc.) to reduce the rate prior to placing concrete.

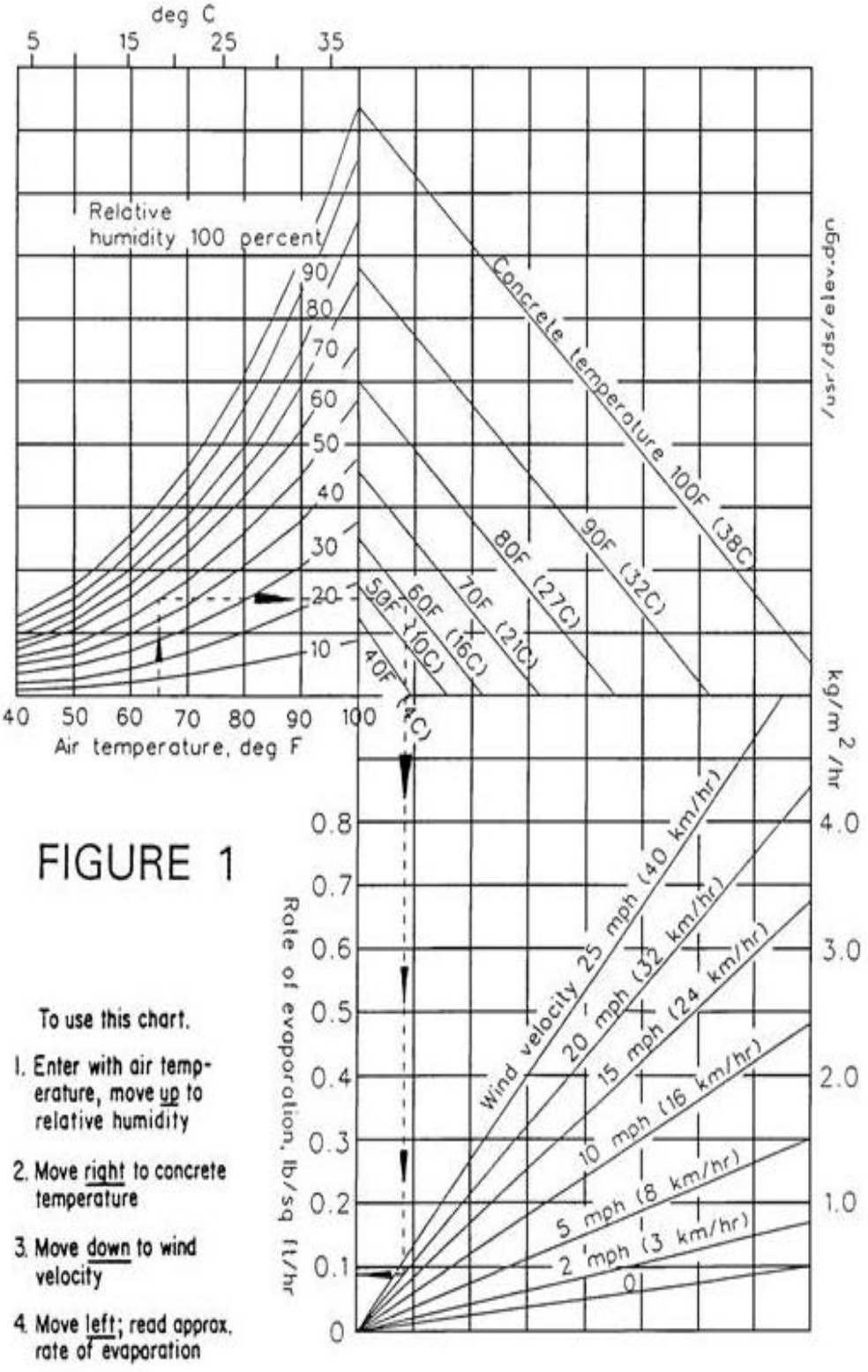

FIGURE 1

To use this chart.

1. Enter with air temperature, move up to relative humidity
2. Move right to concrete temperature
3. Move down to wind velocity
4. Move left; read approx. rate of evaporation

679.4. 5 - Concrete Pavement at Night: If placement of any concrete is to be made at night, a plan which provides adequate lighting for the work area shall be submitted at least 14 days before concrete is placed for the Engineer's approval.

679.4.6 - Hot Weather Provisions: The requirements of ACI 855, Hot Weather Concreting, shall apply except no concrete shall be placed when the ambient air temperature or deck surface temperature, after prewet, is above of 85° F (30° C). Concrete may be placed at an ambient air temperature of 85° F (30° C), if the deck temperature, after prewet, is no higher than 85° F of 85° F (30° C), and falling temperatures are predicted, and then only if the prediction indicates a temperature of under of 85° F (30° C) for the placement period. The time limitations for the placement of wet burlap, as required by 609.3.7.5, shall also apply.

679.4.7 - Cold Weather Provisions: No concrete shall be placed if the ambient air temperature or deck surface temperature, after prewet, is below 50° F (10° C), except as noted. Concrete may be placed at an ambient air temperature of 50° F (10° C) if the deck surface temperature, after prewet, is no less than 50° F (10° C) and rising air temperatures are predicted, and then only if the prediction indicates a temperature of over 50° F (10° C) for the eight hours immediately after placement. If air temperatures are such that the minimum temperature will not be met, the Contractor may place concrete if external heat is provided (refer to 679.4.8).

If the curing temperature drops below 45° F (7° C) during the curing period, then the surface shall be enclosed and external heat shall be provided in accordance with the provisions of 679.4.8. The time required for tenting will not be counted as curing time. Once external heat provisions are required, they shall remain on the surface until curing is complete, regardless of the ambient air temperature.

If curing temperature falls below 32° F (0° C), at any time during the curing period, the concrete will be rejected.

Continuous wetting shall be replaced by wetting at regular intervals if, in the opinion of the Engineer, expected air temperatures could result in freezing of run-off water.

679.4.8 - External Heat Provisions: The provisions of ACI 306, Cold Weather Concreting, and the following modifications shall apply:

a) Temperature limits shall be maintained for 168 curing hours.
b) If the concrete is latex modified concrete, then steam equipment shall not be used to supply external heat after the initial 48 curing hours.
c) Enclosures for heat retention shall be properly vented to prevent surface disintegration from carbon dioxide gas.
d) Continuous wetting will not be required, but the burlap shall be kept wet by wetting at regular intervals in a manner satisfactory to the Engineer for microsilica concrete.

679.4.9 - Defective or Damaged Concrete: After the overlay has been cured, the Contractor in the presence of the Engineer shall sound the deck in order to detect delaminated areas. All defective or damaged concrete, as determined by the

Engineer, shall be repaired or replaced at no additional cost to the Division. Defects shall include but not be limited to delaminations, cracking, tearing, damage or other imperfections. The Contractor shall propose repair methods for approval by the Engineer. All concrete requiring removal and replacement, as determined by the Engineer, shall be removed by sawcutting the perimeter to a depth of ¾ in. ± 1/8 in. (19 mm ± 3 mm). Damaged concrete shall then be chipped out to the level of the original prepared surface. The chipped face shall not undercut the sawcut and shall have a slope of approximately 45°. Chipping hammers shall weigh less than 30 pounds (15 kg), and only chisel bits shall be used. The prepared surface shall be blastcleaned prior to applying the overlay concrete.

679.5 - FINAL BRIDGE DECK FINISH:

679.5.1 – Straightedge Test: After defective or damaged concrete has been repaired and cured in accordance with 679.4.9 and before opening to traffic, the bridge deck shall be grooved perpendicular (or radial) to the centerline of the roadway. Prior to grooving, the entire deck shall be checked by the Contractor in the presence of the Engineer with an approved straightedge not less than 10 ft. (3 m) long. The straightedge shall be laid parallel to the centerline and half-lapped along lines approximately 5 feet (1.5 m) apart to cover the entire deck surface. Surface irregularities of more than 1/8 in. in 10 feet (3 mm in 3 m) shall be removed by grinding. Grinding shall leave a smooth surface within the straightedge tolerance.

679.5.2 – Finished Deck Grooving: After corrective grinding and before opening to traffic, grooves shall be cut into the concrete using a mechanical saw. These grooves shall be 0.10 inch (2.5 mm) wide and 0.25 inch (6 mm) deep. Groove spacing shall be 1.5 inches (37 mm) center to center. No later than one week prior to grooving operations, the Contractor shall provide the Engineer with two accurate, easily readable gauges with which to verify groove dimensions. Groove depth and spacing tolerances are limited to ±1/16 inch (1.5 mm). Groove width tolerances are +0.02 inch (0.5 mm) and -0.0 inch (0 mm). Grooves shall be cut continuously across the deck to within 1 ft. (300 mm) of gutter lines or drainage structures. Grooves shall also be continuous across the full width of the deck surface including construction joints. Grooves shall terminate within 1 in. (25 mm) of any exposed metal component or elastomeric concrete of an expansion joint. When the deck is skewed and the contractor is using gang blades to saw the grooves, the maximum distance (measured perpendicular to the centerline of the expansion joint) from the last groove termination in the pass to the expansion joint shall be 1 ft., 8 inches (200 mm). Radial grooving shall be performed in increments limited to 12 ft. (3.6 m) of bridge length.

679.6 - METHOD OF MEASUREMENT:

679.6.1 - General: The quantity of work performed for Specialized Concrete Overlay shall be measured in cubic yards (meters) of material complete in place and

accepted. If the material is delivered in a mobile mixer, the pay quantity will be based on the printed ticket from the mixer. If the material is delivered from a central batch plant or truck mixer, the pay quantity will be based on the printed batch tickets as required in AASHTO M 157, Section 16, with adjustment for waste. The contractor and the engineer shall agree in advance on a method to determine the volume of the waste.

Test Slab will be measured on a lump sum basis complete in place. This shall include the complete execution of work required herein, regardless of the number of test slabs constructed. This item may be deleted at the discretion of the Engineer.

The quantity of work performed for Slab Reconstruction Concrete shall be measured in Cubic yards (meters) of material complete in place and accepted. Slab Reconstruction Concrete placed monolithic with the overlay shall be included in the overlay quantity. Concrete that is placed separately from the overlay shall be the volume as indicated by the batch quantity tickets for the ready-mix trucks or portable mixers adjusted for any material not incorporated into the work.

Removal of Existing Deck Surface shall be measured in square yards (square meters) of deck area that is to be overlayed. Existing concrete or asphalt removal shall be considered incidental to Removal of Existing Deck Surface as specified herein.

679.7 – BASIS OF PAYMENT:

The quantities, determined as provided above, will be paid for at the contract unit price bid for the items listed below. The price and payment shall be full compensation for all material removal and for furnishing and placing all the materials and doing all the work herein prescribed in an acceptable manner including all labor, tools, equipment, supplies and incidentals necessary to complete the work.

679.7.1 - Rideability Price Adjustments: Section 601.15.2 of the Standard Specifications shall apply to the finish requirements of the specialized concrete overly.

679.8 - PAY ITEMS:

ITEM	DESCRIPTION	UNIT
679002-*	Specialized Concrete Overlay	Cubic Yard (Meter)
679003-*	Removal Of Existing Deck Surface	Square Yard (Meter)
679005-*	Slab Reconstruction Concrete	Cubic Yard (Meter)
679006-*	Test Slab	Lump Sum

* Sequence number

SECTION 688
PAINTING STEEL STRUCTURES

688.1 – Description:

ADD THE FOLLOWING TO THE END OF THE PARAGRAPH.

At no time shall any paint be used beyond the manufacturer's shelf life.

688.2.7 – Handling Steel Structures:

ADD THE FOLLOWING TO THE END OF THE SECTION.

Upon arrival at the project site, if weather conditions were such that deicing materials from the roadway were thrown onto the steel during shipment, the contractor shall be responsible for washing the entire surface of the steel with low pressure water and testing for chloride contamination. This also includes unpainted portions of weathering steel. Water shall be from an approved source of drinking water. The water is to be applied at minimum pressure of 3000 PSI (21 Mpa) to a maximum of 4500 PSI (31 Mpa) at the nozzle end, with the nozzle held at a distance of 4" (100 mm) to 8" (200 mm) from the surface.

After the low pressure wash, a minimum of one area on each piece is to be tested for chloride contamination. The testing shall be by the CHLOR*TEST (chloride test kit) method. The maximum chloride contamination shall be 5 micrograms/cm². If the degree of contamination is above the maximum level, the steel is to be re-washed, using a mixture of low pressure water and a solution of a commercial brand of soluble salt remover, followed by additional testing for chloride contamination. The Soluble Salt Remover shall be CHLOR*RID or equal.

The steel to be washed shall not be erected until it has been washed, tested and accepted.

688.3.2.1 – Materials:

ADD THE FOLLOWING AFTER THE SECOND SENTENCE:

Each coat shall be a contrasting color to the one previously applied.

688.3.2.5 – Paint Application Requirements (Subsection under New Structures):

ADD THE FOLLOWING AS THE THIRD PARAGRAPH:

Touched up areas on silver topcoat, color 17178, shall require a mist coat application of the product to ensure uniformity in the coated surfaces.

688.3.3.1 – Material:

ADD THE FOLLOWING AFTER THE SECOND SENTENCE:

Each coat shall be a contrasting color to the one previously applied.

688.3.3.5 – Coating Application (Subsection under Existing Structures):

ADD THE FOLLOWING AS THE FOURTH PARAGRAPH:

Touched up areas on silver topcoat, color 17178, shall require a mist coat application of the product to ensure uniformity in the coated surfaces.

SECTION 689
METALIZING STEEL

689.4 - APPLICATION OF METALLIC COATING:

ADD THE FOLLOWING AFTER THE FOURTH SENTENCE IN THE FIRST PARAGRAPH:

Field and/or shop bolted contact surfaces shall have the coating applied in the range of 2 to 5 mils (25-125 μm) dry film thickness.

ADD TO THE END OF THE FIRST PARAGRAPH:

The steel shall be cleaned with sharp, angular grit, to at least a near white finish meeting SSPC-SP-10. No shot will be allowed as the blasting abrasive. The profile of the anchor pattern shall be 2-4 mils (50-100 μm).

DIVISION 700
MATERIALS DETAILS

SECTION 702
FINE AGGREGATE

702.1-FINE AGGREGATE FOR PORTLAND CEMENT:

702.1.2 - Deleterious Substances:

DELETE THE TABLE AND INSERT THE FOLLOWING:

MATERIAL	PERCENT BY WEIGHT
Amount finer than No. 200 (75 μm) sieve for manufactured fine aggregate (determined by AASHTO T 11 and T 27). A manufactured fine aggregate is one which has been reduced in particle size by crushing	5.0
Amount finer than No. 200 (75 μm) sieve for all other sands (determined by AASHTO T 11 and T 27)	3.0
Coal and other lightweight deleterious material (determined by MP 702.01.20)	2
Friable particles (determined by MP 703.01.20)	1

SECTION 703
COARSE AGGREGATE

703.1 – CRUSHED STONE:

703.3.1 - Steel Slag:

DELETE THE ENTIRE CONTENTS AND REPLACE THE FOLLOWING:

703.3.1 - Steel Slag: Steel slag, from the production of steel, includes open hearth, electric furnace, and basic oxygen furnace slag. Steel slag is differentiated from air cooled blast-furnace slag which is from the production of iron.

For items where steel slag is used, it must be crushed to its intended item gradation, maintained in a constant wet condition for a period of at least 6 months, and must be rendered sufficiently inert to minimize potential expansion and the discharge of deleterious effluent. The aging period shall begin at the completion of stockpiling and shall be strictly monitored by the supplier. The stockpile shall be isolated with no additional material being added during the aging period. Should additional material be added, the aging period shall start over from the

date of the addition. When aging, stockpiles should be kept at a maximum height of 10 feet to allow adequate moisture penetration throughout the pile.

To evaluate the effectiveness of the aging process expansion tests shall be conducted at the end of the 6-month aging period. The selection of samples for expansion testing shall be on a stratified random basis vertically with at least one sample from each top one-third, middle one-third, and bottom one-third of the stockpile. Samples shall be obtained in accordance with MP 700.00.06, *Aggregate Sampling Procedures*. Expansion values shall not be greater than 0.50 percent at seven days when tested in accordance with applicable portions of ASTM D4792. If one or more of the samples do not meet the 0.50 percent expansion limit after the 6 month aging period, the stockpile shall be kept moist and aged an additional two months, after which expansion tests shall again be conducted in the manner described above. This process shall continue prior to use until the steel slag conforms to the expansion limit. When the stockpile has shown compliance to the expansion test requirements, it may be used in items as directed by the Engineer.

When steel slag is to be used in Hot-Mix Asphalt (HMA), the expansion tests shall be waived. Steel slag, when used in HMA, shall not exceed 50 percent by weight of the coarse fraction of the mix, and in no case shall steel slag be used as a coarse aggregate fraction and a fine aggregate fraction within a single mix.

When steel slag is to be used in items where thickness and quantities are limited and the slag is not confined, such as aggregate shoulders, road stabilization, snow and ice control, etc., the expansion tests may be waived as directed by the Engineer.

In addition to other requirements specified elsewhere in the Contract Documents, for the particular item, acceptance of the material shall be on the basis of the Division's evaluation of the supplier's written certification that the aforementioned aging, moisture, and expansion requirements (where applicable) have been accomplished, and that the level or degree of expansion exhibited meets the expansion criteria. The certification shall include all test data when applicable.

Steel slag shall not be used in any item where expansion might be detrimental. Such items include, but not necessarily limited to, the following: aggregate for Portland Cement concrete, backfill around drainage structures, piers, abutments, walls, etc.

703.3.1.1 - Wearing III (Sand Mix): When fine aggregate steel slag is used in a sand mix all the requirements specified in Section 703.3.1 for coarse aggregate steel slag when used in HMA shall apply with the following exceptions: fine aggregate steel slag shall meet the quality requirements of 702.1.2 and 702.1.3, and shall not exceed 25 percent by weight of the total fine aggregate used in the mix.

ADD THE FOLLOWING SECTION:

703.6 - ACCEPTANCE PLAN FOR GRADING OF COARSE AGGREGATE:

When this section is specified in the bid item the following will apply. Acceptance for gradation shall be on the basis of test results on consecutive random samples from a lot. A lot shall be considered the quantity of material represented by an average test value, not to exceed five sublots. Generally at the beginning of the project, the average shall be started on the second sample in accordance with MP 300.00.51. A sublot is the quantity of material represented by a single gradation test. In the case where only one sample is taken, this sublot shall be considered the lot. The material shall be sampled and tested in accordance with applicable specification. If the testing frequency is one sample or greater per day the gradation test results shall be plotted on a control chart in accordance with MP 300.00.51. When the average, or when the most recent three consecutive individual test values fall outside the limits of Table 703.4 the lot of material represented will be considered nonconforming to the extent that the last of its sublots is nonconforming. When this occurs, the last sublot shall have its price adjusted in accordance with Table 703.6.3. In the case where the average is nonconforming and the last sublot contained is conforming, then there would be no price adjustment. In no event, however, shall a sublot of material have its price adjusted more than once, and the first adjustment, which is determined, shall apply. When the sampling and testing frequency is less than one sample per day the individual sample will be treated as a lot.

703.6.1 - Degree of Nonconformance: When a sublot of material is to have its price adjusted, the percentage point difference between the failing test value and the specification limit shall be determined for each sieve size determined to be nonconforming.

The total measure of nonconformance of an individual sublot is the sum of all failures on the various sieve sizes of that sublot. When the total degree of nonconformance has been established and it is 12.0 or less, the material will be paid for at an adjusted contract price as specified in table 703.6.3. When the degree of nonconformance is greater than 12.0, the nonconforming sublot shall be resolved on an individual basis, requiring a special investigation by the Engineer to determine the appropriate course of action to be followed.

703.6.2 - Basis of Payment: The quantities, previously determined for the individual item, will be paid for at the contract unit price bid for the specified item, which price and payment shall be full compensation for furnishing all the materials, and doing all the work prescribed in a workmanlike and acceptable manner, including all labor, tools, equipment, supplies, and incidentals necessary to complete the work.

703.6.3 - Price Adjustment: Aggregates not conforming with the gradation requirements as described in 703.6 will be paid for at the adjusted contract price based on the degree of nonconformance as specified in Table 703.6.3.

TABLE 703.6.3	
Adjustment Of Contract Price For Gradation Not Within Specifications	
Degree Of Nonconformance	Percent Of Contract Price To Be Reduced
1.1 to 3.0	2
3.1 to 5.0	4
5.1 to 8.0	7
8.1 to 12.0	11
Greater than 12	*
* The Division will make a special evaluation of the material and determine the appropriate action. Pending resolution of the matter, no placement shall be made over the nonconforming material.	

SECTION 704
STONE AND CRUSHED AGGREGATE

704.5-SPECIAL ROCK FILL:

DELETE LAST SENTENCE OF PARAGRAPH TWO AND REPLACE WITH THE FOLLOWING:

Thin Slab-like pieces shall not be used.

DELETE TABLE 704.6.2A AND 704.6.2B AND REPLACE WITH THE FOLLOWING:

TABLE 704.6**.2A – GRADATION REQUIREMENTS**

Gradation Amounts Finer Than Each Laboratory Sieve (Square Openings), % By Weight										
Aggr. class	8” (200)	2½” (63)	2” (50)	1½” (37.5)	1” (25)	3/4” (19)	#4 (4.75)	#40 (425 μm)	#100 (150 μm)	#200 (75 μm)
1				100		50-90	20-50	5-20		0-7.0
2				100		80-100	35-75	10-30		0-10.0
3				100		50-90	20-50	5-20		4.0-12.0
4				100		50-95	20-60	5-35		
5			100				30-90			0-25.0
6				100		50-100	25-70	10-45	3-28	
7	90-100		0-5	with intermediate sizes between 6” (150 mm) and 4” (100 mm) represented						
8				100		80-100	35-75	10-40		4.0-14.0
9		100		80-95		50-70	20-40			0 - 8.0
10 *					100	70-100	30-75	8-40		4.0-20.0

* Crusher Run Material Only

TABLE 704.6.2B - QUALITY REQUIREMENTS

Aggr. class	Los Angeles Abrasion, Percent Max.	Sodium Sulfate Soundness, Percent Max.	Liquid Limit Max.	Plasticity Index Max.	Deleterious Material, Percent Max.
1	50	12	25	6	5
2	50	12	25	6	5
3	50	12	25	6	5
4	Note 1		25	6	5
5			25	6	5
6			25	6	5
7		30			10 (by visual observation)
8	50	12	25	6	5
9	50	12	25	6	5
10	50	12	25	6	5

Note 1: The Los Angeles Abrasion value of aggregate comprising the base course shall be treated in the manner hereinafter set forth to determine the specification requirement for the item:

STABILIZATION REQUIREMENTS

Los Angeles Abrasion Value Assigned to the Base Course Aggregate	LA≤50	None
	50<LA≤65	Top 4 inches (100 mm)
	65<LA≤80	Top 6 inches (150 mm)
	80<LA	Top 8 inches (200 mm)

SECTION 705
ASPHALT MATERIALS

705 - TEMPERATURE CONVERSION FACTORS TABLE:

Change the reference to “Asphalt Cement” in the table to read “Performance Graded Binder”.

TABLE 705 – APPLICATION TEMPERATURES:

DELETE ALL REFERENCES TO AEM-2, AEM-3, AND AEM-4 FROM TABLE 705.

DELETE THE “ASPHALT CEMENT” SECTION OF THE TABLE AND REPLACE WITH THE FOLLOWING:

Performance Graded Binder		
PG 58-28	285-350 (141-177)	250-338 (121-170)
PG 64-28	285-350 (141-177)	250-338 (121-170)
PG 64-22	285-350 (141-177)	250-338 (121-170)
PG 70-22	285-350 (141-177)	250-338 (121-170)

DELETE SECTION 705.5 AND REPLACE WITH THE FOLLOWING:

705.5 – PERFORMANCE GRADED BINDERS:

Performance graded binders shall conform to the requirements of AASHTO M320. In addition, performance graded binders specified at a high temperature grade of 76 or greater (example: PG 76-22) shall also meet an elastic recovery requirement of 70% when tested in accordance with AASHTO T301 on a residue sample obtained from the rolling thin-film oven prepared in accordance with AASHTO T240.

ADD THE FOLLOWING SUBSECTION:

705.12 – POLYMER-MODIFIED CATIONIC EMULISFIED ASPHALT:

Polymer-modified cationic emulsified asphalt shall conform to the requirements of AASHTO M 316.

SECTION 707
CONCRETE ADMIXTURES, CURING AND COATING MATERIALS

ADD THE FOLLOWING AT THE END OF THE SECTION **707.2.2.1:**

When a Type G admixture is used for the sole purpose of increasing the slump of the subject concrete mix (no water is removed when this admixture is added), the requirements of AASHTO M 194 for water reduction and compressive strength increases will be waived.

ADD THE FOLLOWING AT THE END OF THE SECTION **707.3.2.1:**

When a Type F admixture is used for the sole purpose of increasing the slump of the subject concrete mix (no water is removed when this admixture is added), the requirements of AASHTO M 194 for water reduction and compressive strength increases will be waived.

707.4.3 - Microsilica Admixture:

DELETE THE CONTENTS OF THE FOLLOWING SUBSECTION AND INSERT THE FOLLOWING:

The microsilica admixture shall be supplied in either a densified powder or slurry form or a blend of Portland cement and densified powder. The slurry shall be homogeneous and agitated as necessary to prevent separation. The microsilica admixture will be accepted at the work site provided it meets all of the following requirements:

a) Manufacturer's written certification that the material supplied meets all of the requirements of AASHTO M307.

The microsilica slurry admixture shall be maintained in storage above the temperature of 32° F (0° C). Slurries exposed to temperatures of 32° F (0° C) or lower shall be removed and replaced at no additional cost to the Department. Water in the slurry shall meet the requirements of Section 601.2 of the Specifications.

b) Only one brand from one source shall be supplied.

INSERT THE FOLLOWING SUBSECTION:

707.5 - LATEX ADMIXTURE:

Formulated latex modifier shall be Dow Modifier A, Tylac 97-314 (Thermoflex 8002), BASF Latex 1186 or Deco-Ray 4776. The manufacturer of these products shall certify that the latex being supplied is of equal formulation to that supplied to the FHWA Turner-Fairbank Highway Research Station for initial approval. Other Styrene-Butadiene latex modifiers may be used provided they have been tested in accordance with and meet the acceptance criteria of the testing program outlined in Report No. FHWA-RD-78-35 of the Federal Highway Administration. The manufacturer shall certify that the latex being supplied meets the acceptance criteria used in the testing program. Only one brand shall be supplied. Samples taken at the job site shall contain a minimum of 46% solids in the latex when tested in accordance with MP 679.03.00.

The latex admixture shall be agitated as necessary to prevent separation of the emulsion. It shall be maintained in storage within the temperature range of 35° F (2° C) to 85° F (29° C). Admixture obtaining temperatures outside the foregoing limits shall be removed and replaced at no additional cost to the Division.

DELETE THE SECTION AND INSERT THE FOLLOWING:

707.12 - CONCRETE SEALER:

707.12.1 - General: The material shall be a one component, water repellant penetrating sealer, meeting the criteria listed in section 707.12.2. The

material shall be capable of meeting the criteria with a single coat and shall not alter the color of the treated surfaces.

707.12.2 - Acceptance: The Contractor shall furnish certified laboratory test data showing the material meets the following performance requirements:

1. Absorption - ASTM C642 (non-air entrained concrete). Concrete should be proportioned and mixed in accordance with ASTM C672. Sealed concrete, under total immersion, will not exceed 1.0% absorption after 48 hours or 2.0% absorption after 50 days.
2. Scaling Resistance - ASTM C672. A rating of "No Scaling" after 100 cycles on the sealed concrete (non-air entrained concrete) as compared to "Severe Scaling" on untreated concrete.
3. NCHRP 244, Series II - Cube Test
    3.1 Weight Gain - not to exceed 25% of untreated cube.
    3.2 Absorbed Chloride - not to exceed 25% of untreated cube.
4. NCHRP 244, Series IV - Southern Exposure
    4.1 Absorbed Chloride - not to exceed 10% of untreated concrete.

ADD THE FOLLOWING SECTION:

707.13 - ACCELERATING ADMIXTURES FOR CONCRETE:

707.13.1-Acceptance Requirements for Approval of Accelerators: Accelerating admixtures for concrete shall be non-chloride and shall conform to the requirements of AASHTO M 194, Type C.

707.13.2-Performance Requirements for Concrete Accelerators:

707.13.2.1-The effects of using accelerating admixtures may vary widely with different types of cement, cement from different mills, aggregate proportions, aggregates from different sources and of different gradation, and changes in water-cement ratio. Therefore, no accelerator shall be used until the concrete of the specified class, designed in accordance with these Specifications and made with the ingredients proposed for use by the Contractor, including Type C admixtures as specified or permitted under this Specification, is shown to meet the requirements of AASHTO M 194 for compressive strength at ages 3, 7, and 28 days.

707.13.2.2-The mix shall contain the quantity of admixture recommended by the manufacturer at the prevailing temperature.

707.13.3-Certification of Accelerating Admixtures: When a Contractor proposes to use an approved accelerating admixture, the procedure set forth in 707.2.4 shall apply.

707.13.4-Additional Test Requirements for Accelerating Admixtures (Optional): Either prior to or at any time during construction, the Engineer may require the selected admixture to be tested further to determine its effect on the strength of the concrete. When so tested, the accelerator shall meet the requirements specified in 707.13.2.

707.14 - WATER-REDUCING AND ACCELERATING ADMIXTURES FOR CONCRETE:

707.14.1-Acceptance Requirements for Approval of Water-Reducing and Accelerating Admixtures: Water-reducing and accelerating admixtures for concrete shall be non-chloride and shall conform to the requirements of AASHTO M 194, Type E.

707.14.2-Performance Requirements for Concrete Water-Reducing and Accelerating Admixtures:

707.14.2.1-The effects of using water-reducing and accelerating admixtures may vary widely with different types of cement, cement from different mills, aggregate proportions, aggregates from different sources and of different gradation, and changes in water-cement ratio. Therefore, no water-reducing accelerator shall be used until the concrete of the specified class, designed in accordance with these Specifications and made with the ingredients proposed for use by the Contractor, including Type E admixtures as specified or permitted under this Specification, is shown to meet the requirements of AASHTO M 194 for water reduction and compressive strength increases at ages 3, 7, and 28 days.

707.14.2.2-The mix shall contain the quantity of admixture recommended by the manufacturer at the prevailing temperature.

707.14.3-Certification of Water-Reducing and Accelerating Admixtures: When a Contractor proposes to use an approved water-reducing and accelerating admixture, the procedure set forth in 707.2.4 shall apply.

707.14.4-Additional Test Requirements for Water-Reducing and Accelerating Admixtures (Optional): Either prior to or at any time during construction, the Engineer may require the selected admixture to be tested further to determine its effect on the strength of the concrete. When so tested, the water-reducing accelerator shall meet the requirements specified in 707.14.2.

ADD THE FOLLOWING SECTIONS:

707.15 - HYDRATION CONTROL ADMIXTURES FOR CONCRETE:

707.15.1-Acceptance Requirements for Approval of Hydration Control Admixtures: Hydration control admixtures for concrete shall conform to the requirements of AASHTO M 194, Type D.

707.15.2-Performance Requirements for Concrete Hydration Control Admixtures:

707.15.2.1-The effects of using hydration control admixtures may vary widely with different types of cement, cement from different mills, aggregate proportions, aggregates from different sources and of different gradation, and changes in water-cement ratio. Therefore, no hydration control admixture shall be used until the concrete of the specified class, designed in accordance with these Specifications and made with the ingredients proposed for use by the Contractor, including hydration control admixtures as specified or permitted under this Specification, is shown to meet the requirements of AASHTO M 194 for water reduction and compressive strength increases at ages 3, 7, and 28 days.

Upon completion of mixing of this trial batch, air content and slump tests in accordance with section 601.4.1 shall be performed on the plastic concrete containing the hydration control admixture. A test to establish the initial and final times of setting of the concrete mix shall also be performed in accordance with ASTM C403. The air content and slump tests shall then be repeated at 45-minute intervals until a period of 3-hours after the completion of mixing has elapsed.

The value obtained by any of the air content tests during the 3-hour period shall not vary from the value obtained by the initial air content test by more than 2.5 percentage points.

The value obtained by any of the slump tests during the 3-hour period shall not vary from the value obtained by the initial slump test by more than 1.75 inches (445 mm).

707.15.2.2-The mix shall contain the quantity of admixture recommended by the manufacturer at the prevailing temperature.

707.15.3-Certification of Hydration Control Admixtures: When a Contractor proposes to use an approved hydration control admixture; the procedure set forth in 707.2.4 shall apply.

707.15.4-Additional Test Requirements for Hydration Control Admixtures (Optional): Either prior to or at any time during construction, the Engineer may require the selected admixture to be tested further to determine its effect on the strength of the concrete. When so tested, the hydration control admixture shall meet the requirements specified in 707.15.2.

SECTION 708
JOINT MATERIALS

708.3 – JOINT SEALANT, HOT-POURED FOR CONCRETE AND ASPHALT PAVEMENTS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

This material shall meet the requirements of ASTM D6690. Unless otherwise specified, Type II sealant shall be used.

SECTION 709
METALS

709.3 – BLANK

DELETE THE SUBSECTION AND HEADER AND REPLACE WITH THE FOLLOWING:

709.3 – HOOK EXPANSION BOLTS FOR FASTENING WIRE MESH IN SHOTCRETE APPLICATIONS:

Hook fasteners for wire mesh reinforcement used in shotcrete applications shall meet the requirements of American Iron and Steel Institute (AISI) C1010 through C1018.

709.8 – HIGH STRENGTH LOW ALLOY STRUCTURAL METAL:

DELETE THE FIRST SENTENCE AND REPLACE WITH THE FOLLOWING:

High-strength structural steel for bridges shall conform to AASHTO M270, grades 50, 50W, or HPS 70W.

709.12 - STRUCTURAL AND EYEBAR STEEL:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

All structural steel for bridges shall conform to the applicable grade of AASHTO M270 that is specified in the Plans. When no specific grade is called for, AASHTO M270, Grade 36 shall be used. Non-designated structural steel in all other sections of the Specifications shall conform to ASTM A36.

709.15 - COATED DOWEL BARS & DOWEL BASKET ASSEMBLIES:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Coated dowel bars shall meet the requirements of AASHTO M254 except that the steel used to make the dowel bars shall meet the requirements of Section 709.1. Additionally, the coating applicator shall meet the requirements of Section 709.1.2 and the saw cut ends of the coated dowel bars shall be touched-up with a coating material in accordance with the requirements of Section 602.6.2.

709.45 - GALVANIZED STEEL GUARDRAIL POSTS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Steel guardrail posts shall be fabricated from steel meeting the requirements of ASTM A36 or fabricated in accordance with ASTM A 769, Grade 40. They shall be of a section, length and weight as specified on the Plans. The weight shall not be less than 97.5 percent of that specified.

Galvanizing shall be in accordance with AASHTO M 111, with a minimum of 2 oz. per square foot (600 grams per square meter).

709.46 - STEEL POSTS, POST BRACES AND GATE FRAMES FOR RIGHT-OF-WAY FENCE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Unless otherwise specified, all right-of-way fence posts, post braces and gate frames shall meet the requirements of AASHTO M 181. Either Grade 1 or Grade 2 may be used unless one is specifically called for in the contract. Pipe members shall have the dimensions and weights called for on the Plans.

SECTION 711
PAINTS, COATINGS, OILS, AND INKS

DELETE THE SECOND PARAGRAPH AND INSERT THE FOLLOWING:

General Requirements: The finished products shall not settle excessively nor cake in the container, shall be readily mixed with a paddle to a smooth uniform paint of specified consistency and working properties. The product shall not thicken, liver, skin, or curdle. The paint shall have a storage life of at least 12 months. No product may have VOC's in excess of 3.5 lb./gal (420 g/l).

711.6-FIELD PRIMER:

DELETE THE HEADING AND CONTENTS AND REPLACE THE FOLLOWING:

711.6-ORGANIC ZINC PRIMER:

711.6.1-General: This primer may be used in the shop on new steel or in the field on existing steel. When used as a shop primer, the material shall have a minimum slip coefficient of 0.50 (Class B) when tested in accordance with "Test Method to Determine the Slip Coefficient for Coatings used in Bolted Joints" as adapted by the Research Council on Structural Connections. Acceptance for field use shall be based on batch testing on materials that do not meet the minimum of 0.50 (Class B) slip coefficient. Initial approval of all material will be based on complete testing to assure specification compliance. The steel shall be capable of being blast cleaned to a near-white finish, SSPC-SP-10, for new steel, and to a commercial finish, SSPC-SP-6, for existing steel. The primer may be top coated with materials meeting the requirements of Sections 711.20.3 and 711.20.4. The dry film thickness requirement for this material is three mils (75 μm) minimum unless specified otherwise.

711.6.2–Vehicle: The organic vehicles may include phenoxies, catalyzed epoxies, urethanes, chlorinated rubbers, styrenes, silicones, vinyls, and other suitable resinous binders. They may be chemically cured or may dry by solvent evaporation. Under certain conditions, as approved by the Engineer, heat may be used to facilitate or accelerate hardening.

711.6.3-Physical Requirements:

		Minimum	Maximum	ASTM
i.	Total Solids, % by weight of paint	70		D2369
	Variance shall be within ±2% of the percent solids by weight of the previously qualified paint.			
ii.	Pigment, % by weight of total solids	83		D521
iii.	Total zinc dust, % by weight of pigment	93		D521
iv.	Total zinc dust, % by weight of total solids	77		
v.	Mudcracking – The coating when applied to a five to six mil (125-150 μm) dry film thickness, shall show no mudcracking when viewed under 8X magnification.			
vi.	Adhesion – Shall be no less than 4B when evaluated in accordance with ASTM D 3359, Method B.			
vii.	Salt Spray- Testing shall be in accordance with ASTM B117. After 1000 hours of continuous exposure, there shall be no evidence of checking, cracking, rusting, or blistering.			
viii.	Viscosity of the mixed paint shall be in accordance with ASTM D 562. Variance shall be within ±10 Krebs Units of the viscosity of the previously qualified paint.			
ix.	Weight per gallon of the mixed paint shall be in accordance with ASTM D 1475. Variance shall be within ±0.5 pounds (225 g) of the weight per gallon of the previously qualified paint.			

711.8-FIELD PRIMER-SLOW DRYING:

711.8.2 – DELETE THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

711.8.2 – Physical Requirements:

		Minimum	Maximum	ASTM
i.	Pigment	48	52	D2371
ii.	Volatiles		20	D2369
iii.	Nonvolatile vehicle	31		
	Calculated by difference			Fed-Std-141 (4053
iv.	Viscosity, KU	72	89	D562
v.	Weight per gallon, pounds	11.5		D1475
vi.	Fineness of grind, Hegman units	3.0		D1210
vii.	Dry time, hours			
	Set to touch		10	Fed-Std-141 (4061)
	Dry hard		36	Fed-Std-141 (4061)

711.11 – PIGMENTED FINISH COAT:

711.11.1 - General:

DELETE THE SIXTH SENTENCE, REPLACE WITH FOLLOWING:

The field adhesion of the system (primer, 711.10, 711.11) shall be at least 3A when tested in accordance with ASTM D3359.

DELETE THE TABLE AND SUBSTITUTE THE FOLLOWING LIST:

FEDERAL STANDARD NUMBER

14062
14223
14241
17178
20062
30045

711.11.2 – Physical Requirements

iv. Gloss @ 60º - DELETE THE MINIMUM REQUIREMENT OF 50 AND SUBSTITUTE THE FOLLOWING:

iv. Gloss @ 60º shall be 30-50 for semi-gloss and 51 or greater for gloss finishes. Flat finishes shall have a gloss of 29 or less.

711.12 – EPOXY MASTIC MAINTENANCE COATING:

711.12.1 - General:

INSERT AT THE END AS A NEW PARAGRAPH:

The coating may be used as a primer over steel that has been cleaned to a minimum of a commercial finish meeting SSPC-SP-6. It may be top coated with 711.20.3 and 711.20.4.

711.12.3 - Physical Requirements:

DELETE v "FLEXIBILITY" AND INSERT THE FOLLOWING:

A steel panel that is No. 20 gage (0.0375 in. or 0.952 mil), but in no case, no thinner than No. 24 gage (0.025 in. or 0.635 mil) shall be blasted to a white finish meeting SSPC-SP-5, and dried for 14 days at 75° ± 5° F (24° C ± 3° C). The epoxy mastic coating shall be applied at a minimum of 5 mils (125 μm) dry film thickness. The coating shall display no signs of cracking or loss of adhesion when the panel is uniformly bent 180° around an 1/8 inch (3 mm) diameter mandrel.

711.12.6 – Colored Epoxy-mastics:

DELETE THE TABLE AND SUBSTITUTE THE FOLLOWING LIST:

FEDERAL STANDARD NUMBER

14062
14223
14241
17178
20062
30045

ADD THE FOLLOWING SUBSECTION:

vii. Gloss @ 60º shall be 30-50 for semi-gloss and 51 or greater for gloss finishes. Flat finishes shall have a gloss of 29 or less.

ADD TO THE TABLE IN SUBSECTION **711.12.6:**

Federal Standard Number	x Coordinates	y Coordinates	Y Coordinates
26373	0.3054	0.3156	37.19

711.20 – INORGANIC ZINC RICH SYSTEM:

711.20.1 – General:

DELETE THE SEVENTH SENTENCE.

"The use of an intermediate coat shall be the option of the top coat manufacturer."

711.20.2-Primer:

DELETE THE FIRST PARAGRAPH AND SUBMIT THE FOLLOWING:

This primer shall meet the requirements set forth in MP 711.20.59 with the following changes:

DELETE x-ray diffraction

DELETE accelerated weathering

DELETE bullet hole immersion test

DELETE humidity test

DELETE primer field performance requirement

DELETE infrared spectrum

DELETE the VOC (volatile organic compound) requirement and REPLACE WITH THE FOLLOWING: The VOC shall not exceed 3.5 lb/gal (420 kg/m²) for shop or field application.

DELETE the adhesion requirement and REPLACE WITH THE FOLLOWING: The adhesion shall be a minimum of 3B when tested in accordance with MP 711.00.20.

ADD THE FOLLOWING AS THE SECOND NUMBERED ITEM IN THE SECTION:

4.3.2 Delete the VOC (volatile organic compound) requirement and substitute the following: The VOC shall not exceed 3.5 lbs/gal (420 kg/m³) for shop or field application.

711.20.4 - Top Coat:

FEDERAL STANDARD NUMBER
14062
14223
14241
17178
20062
30045

711.20.4.1-Physical Requirements:

DELETE ITEM iii AND REPLACE WITH THE FOLLOWING:

iii. Color – The color choices permissible are from Federal Standard 595. The color difference, ΔE, of the acceptance samples shall not be more than five units from the Standards listed below:

DELETE vii. GLOSS AND SUBSTITUTE THE FOLLOWING:

vii. Gloss @ 60º shall be 30-50 for semi-gloss and 51 or greater for gloss finishes. Flat finishes shall have a gloss 29 or less.

711.21 – GALVANIZE REPAIR (ZINC RICH PRIMER):

DELETE THE LAST SENTENCE AND REPLACE WITH THE FOLLOWING:

This primer shall meet the requirements of Military Specification DOD-P-21035A, Federal Specification TTP-641, Section 711.6, or Section 711.20.2.

DELETE ITEM iv AND REPLACE WITH THE FOLLOWING:

iv. Salt Spray – Testing shall be in accordance with ASTM B117. After 1000 hours of continuous exposure, there shall be no evidence of checking, cracking, rusting, or blistering.

DELETE THE HEADING AND REPLACE WITH THE FOLLOWING:

711.22 – ZINC RICH LOW VOC SYSTEM:

711.22.1 - General:

DELETE ALL AFTER THE FIRST PARAGRAPH AND INSERT THE FOLLOWING:

All products are to have a VOC of 2.8 lbs (1.02 kg) Max. except the primer, which can go to 3.5 lbs (1.52 kg) Max. The fabricator responsible for the major portion of the painting will choose the paint system.

711.22.2 - Primer:

DELETE THE SENTENCE AND INSERT THE FOLLOWING:

The primer shall meet the requirements of 711.6 or 711.20.2.

711.22.4.1 - Requirements:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

i. Dry Hard - 24 Hours Maximum
ii. Color – Shall meet the requirements of 711.20.4 (iii).
iii. Gloss @ 60º shall be 30-50 for semi-gloss and 51 or greater for gloss finishes. Flat finishes shall have a gloss of 29 or less.

711.22.5.1 - System Requirements:

DELETE PARAGRAPH “ii. Accelerated Weathering”. REPLACE WITH THE FOLLOWING:

ii. Accelerated Weathering - After cycling 1000 hours there shall be no evidence of checking, cracking, rusting, or blistering. The degree of chalking shall not be less than No. 6 when tested according to ASTM D4214. The color difference after 1000 hours shall be no more than five ΔE units.

DELETE ITEM iii AND REPLACE WITH THE FOLLOWING:

iii. Salt Spray – Testing shall be in accordance with ASTM B117. After 1000 hours of continuous exposure, there shall be no evidence of checking, cracking, rusting, or blistering.

ADD THE FOLLOWING:

iv. Fexibility
(1/2 in. (13 mm) mandrel) – No failure

v. Chemical Resistance – The top coat shall show no visual deterioration other than minor discoloration, after seven days exposure to:
   a. Ten percent sulfuric acid solution
   b. Ten percent sodium hydroxide solution

711.40 – Temporary White or Yellow Traffic Paint:

DELETE THIS SUBSECTION AND INSERT THE FOLLOWING:

711.40 – Temporary White Or Yellow Traffic Zone Paint: Temporary Traffic Zone Paint shall be any commercially available white or yellow paint designed for use on highways. The paint shall be applied with glass beads, designed by the manufacturer to be compatible with the paint.

711.40.1 - Color and Retroreflectivity Requirements: The Contractor may retest any areas or sections reported as being deficient, in the presence of a project inspector, in order to verify the deficiency of the areas or sections. However, the final decision in regards to requiring re-striping shall be at the Project Engineers discretion.

Markings placed on or after October 1st, and prior to April 15th of the following year shall be exempt from the warranty and performance criteria of these specifications and shall not be considered for replacement based on the retroreflectivity and color requirements herein.

COLOR: After the application of the glass beads or other retroreflective elements, each color installed shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits within three (3) and up to thirty (30) days after application:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The pavement markings shall be visually checked by the Engineer at any time during the above stated warranty period, and shall show no appreciable

discoloration. Markings not meeting the above visual criteria shall be subject to replacement by the Contractor at no additional charge to the Division.

If necessary, the Engineer may at any time during the warranty period use a portable colorometer to determine if the markings have faded or darkened beyond the above CIE Chromaticity Coordinate Limits. The Colormeter used shall be a LTL-Y or other hand held colormeter device approved by the Division.

RETROREFLECTIVITY: The markings shall be visibly retroreflective, under both dry conditions and conditions of moderate rainfall, within three (3) and up to thirty (30) days after application. The markings shall be readily visible when viewed with automobile headlights at night. Markings not meeting the above visual criteria shall be subject to replacement by the Contractor at no additional charge to the Division.

If necessary, retroreflectivity readings representing an adequate sampling, to be determined by the Project Engineer, may be performed by Division personnel. Readings shall be taken with an LTL 2000, or approved equal, hand held Retroreflectometer. The markings shall have a minimum retroreflective reading of 150 mc/1x/m² within three (3) and up to thirty (30) days after application. A 5% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a hand held retroreflectometer.

711.41-WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE II)

DELETE THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

711.41-WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE II):

711.41.1-General: The pavement marking material shall be formulated as a medium-life pavement marking system capable of providing a minimum of one year of continuous performance. Solvent born paint, methyl methacrylate, chlorinated rubber, or other short duration products will be not approved.

The composition of the paint shall be left to the discretion of the pavement marking manufacturer. The Contractor shall provide a pavement marking system to meet the performance requirements specified herein.

During the pavement marking warranty period, the pavement marking materials furnished and installed shall show no loss greater than five (5) percent due to tracking, chipping, spalling, poor adhesion to the pavement, and damage from traffic and normal wear. Loss due to pavement failure, unless caused by the marking material, will not be considered as a material failure and will not be included in the loss calculations and/or retroreflectivity readings.

There shall be no materials testing associated with the application of warranted pavement marking. However, the binder, bead type(s), application rate, and all other particulars shall be provided to the Engineer.

The pavement marking material shall be mixed uniformly throughout and shall have a homogeneous dispersement of color and beads when applied to the

pavement. The material shall have a uniformly thick cross-section through its entire length.

The pavement marking material used shall be capable of being applied at a minimum ambient air temperature of fifty (50) degrees Fahrenheit.

The warranty and performance criteria of this specification shall apply to Type II markings placed on or after April 15th and prior to October 1st. Markings placed prior to April 15th, and on or after October 1st shall be exempt from the warranty and performance criteria of these specifications and shall not be considered for replacement based on the retroreflectivity and color requirements herein.

711.41.2 – Color and Retroreflectivity Requirements: The Contractor may retest any areas or sections reported as being deficient, in the presence of a project inspector, in order to verify the deficiency of the areas or sections. However, the final decision in regards to requiring re-striping shall be at the Project Engineers discretion.

COLOR: After the application of the glass beads or other retroreflective elements, each color installed shall fall within the boundaries created by the following

CIE Chromaticity Coordinate Limits:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The color shall show no appreciable discoloration due to aging during the warranty period of this pavement marking. Pavement markings shall be visually checked by the Engineer at any time during the warranty period of this pavement marking.

Additionally, the Engineer may at any time during the warranty period of this marking use a portable colorometer to determine if the markings have faded or darkened beyond the above described CIE Chromaticity Coordinate Limits. The Colormeter used shall be a LTL-Y or other hand held colormeter device approved by the Division.

RETROREFLECTIVITY: Markings installed on or after April 15th and prior to October 1st shall maintain a minimum retroreflectivity value of 200 mcd/m2/lx for white pavement markings and 150 mcd/m2/lx for yellow pavement markings for one (1) year.

Readings shall be taken with a LTL-2000, or Traffic Engineering Division approved equal, 30 meter geometry retroreflectometer. A 5% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested

with a hand held retroreflectometer. A 15% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a mobile retroreflectometer.

711.41.3-Sampling and Testing Procedures for Performance Samples: The Division may conduct periodic pavement marking reviews throughout the warranty period of the markings. These reviews will occur at any time up to one (1) year after the markings have been placed. These reviews will evaluate the pavement marking material within the project limits for either day and night acceptability considering all requirements listed above. The following method will be used to measure the retroreflectivity and color acceptance of the pavement marking material:

- Locate and identify the starting point for measuring retroreflectivity of pavement markings for a roadway. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading. Repeat this procedure at each mile point in the project, taking 5 readings per line over a 1000 foot section (500 feet on either side of the mile point), and averaging. Samples should be spaced out evenly over the entire 1000 foot section.
- From each failed mile point, obtain an additional five readings for each failed line at a point 1/2 mile in each direction from the original failure point. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading.
- If the readings at either 1/2 mile point from the original failure point fail, the Contractor shall be required to re-stripe the entire 1/2 mile section between the original failure point and the failed 1/2 mile point.
- If the readings at either 1/2 mile point from the original failed point pass, the Contractor shall be required to re-stripe a distance of ¼ mile from the original failed point in the direction of the passing ½ mile point.
- No readings shall be required to be taken between successive failing mile points and successive passing mile points. The Contractor shall be required to re-stripe the entire 1-mile section between successive failing mile points.
- If a project is less than one-mile in length, but longer than ½ mile, 20 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped. If a project is ½ mile or less in length, 10 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped.

During the warranty period of this pavement marking, if any markings greater than 1000 feet are found to be deficient for any reason, the Contractor will be given notification stating the locations and the type of deficiency. These notifications will be given at any time within one (1) year of the initial installation of the markings. The Contractor shall completely replace the deficient markings, as directed by the Engineer, within twenty (20) calendar days of the written notification. Retroreflectivity and color may be checked after re-application of the pavement marking to ensure that segment meets the minimum values specified above.

If the Contractor does not complete the replacement of all of the deficient pavement markings by the end of the twenty (20) calendar day replacement period the Contractor shall be subject to the liquidated damages as described within Section 108.7 of the West Virginia Department of Highway's Standard Specifications until replacement is completed. These liquidated damages shall not stop during the winter shut-down period. No direct payment shall be made for the replacement of any deficient pavement marking during the one-year warranty period as such work shall be considered as incidental to the work as paid for by the various pavement marking items in the contract.

711.42 – WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE IX)

DELETE THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

711.42 – WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE IX):

711.42.1 – General: The pavement marking material shall be formulated as a medium life pavement marking system capable of providing a minimum of two years of continuous performance as specified by the retroreflective parameters established within this contract. The pavement marking shall be a Fast-Dry, High-Build, Acrylic Waterborne product which utilizes a crosslink polymeric binder as an acrylic emulsion. This pavement marking material shall be lead free and be suitable for bituminous and concrete pavements. The material shall be capable of retaining reflective glass beads of the drop-on or spray-on type as specified by the bead manufacturer. The binder, as provided by the pavement marking manufacturer, shall incorporate Rohm and Haas HD-21A, Dow Chemicals UCAR Latex DT 400, or other Traffic Engineering Division approved equal. This material shall not be applied at less than 20 mil wet thickness. Other particulars concerning the composition of the paint shall be left to the discretion of the pavement marking manufacturer. The Contractor shall provide a pavement marking system to meet the performance requirements of the subsequent sections.

During the pavement marking warranty period, the pavement marking materials furnished and installed shall show no loss greater than five (5) percent due to tracking, chipping, spalling, poor adhesion to the pavement, and damage from traffic and normal wear. Loss due to pavement failure, unless caused by the marking material, will not be considered as a material failure and will not be included in the loss calculations and/or retroreflectivity readings.

There shall be no materials testing associated with this warranted pavement marking scheme, but the binder and bead type(s), application rate, and all other particulars shall be provided to the Engineer.

The pavement marking material shall have a homogeneous disbursement of color and beads when applied to the pavement. The material shall have a uniformly thick cross-section through its entire length.

The pavement marking material used shall be capable of being applied at a minimum ambient air temperature of fifty (50) degrees Fahrenheit.

The warranty and performance criteria of this specification shall apply to Type IX markings placed on or after April 15th and prior to October 1st. Markings placed prior to April 15th, and on or after October 1st shall be exempt from the warranty and performance criteria of these specifications and shall not be considered for replacement based on the retroreflectivity and color requirements herein.

711.42.2 – Color and Retroreflectivity Requirements:

COLOR: After the application of the glass beads or other retroreflective elements, each color installed shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The color shall show no appreciable discoloration due to aging during the warranty period of this pavement marking. Pavement markings shall be visually checked by the Engineer at any time during the warranty period of this pavement marking. Additionally, the Engineer may at any time during the warranty period of this marking use a portable colorometer to determine if the markings have faded or darkened beyond the CIE Chromaticity Coordinate Limits. The Colormeter used shall be a LTL-Y or other hand held colormeter device approved by the Division.

RETROREFLECTIVITY: The pavement marking system installed shall maintain a minimum reflectance value of 300 mcd/m2/lx for white pavement markings, and 200 mcd/m2/lx for yellow pavement markings for a minimum of 75 days. After the initial 75 day reading, the minimum reflectance value of 175 mcd/m2/lx for white, and 150 mcd/m2/lx for yellow pavement markings shall be maintained for the remainder of the two year warranty period.

Readings are to be measured with a LTL-2000, or Traffic Engineering Division approved equal, 30 meter geometry retroreflectometer. A 5% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a hand held retroreflectometer. A 15% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a mobile retroreflectometer.

711.42.3 - Sampling and Testing Procedures for Performance Samples:
There may be periodic pavement marking reviews throughout the warranty period. These reviews will occur at any time after the markings have been placed. These reviews will evaluate the pavement marking material within the project limits for either day and night acceptability considering all requirements listed

above. The following method will be used to measure the retroreflectivity acceptance of the pavement marking material:

- Locate and identify the starting point for measuring retroreflectivity of pavement markings for a roadway. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading. Repeat this procedure at each mile point in the project, taking 5 readings per line over a 1000 foot section (500 feet on either side of the mile point), and averaging. Samples should be spaced out evenly over the entire 1000 foot section.
- From each failed mile point, obtain an additional five readings for each failed line at a point 1/2 mile in each direction from the original failure point. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading.
- If the readings at either 1/2 mile point from the original failure point fail, the Contractor shall be required to re-stripe the entire 1/2 mile section between the original failure point and the failed 1/2 mile point.
- If the readings at either 1/2 mile point from the original failed point pass, the Contractor shall be required to re-stripe a distance of ¼ mile from the original failed point in the direction of the passing ½ mile point.
- No readings shall be required to be taken between successive failing mile points and successive passing mile points. The Contractor shall be required to re-stripe the entire 1-mile section between successive failing mile points.
- If a project is less than one-mile in length, but longer than ½ mile, 20 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped. If a project is ½ mile or less in length, 10 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped.

During the warranty period, if any markings along a 1,000 foot or more section of pavement are found to be deficient for any reason, the Contractor will be given notification stating the locations and the type of deficiency. These notifications will be given at any time within two (2) years of the initial installation of the markings. The Contractor shall completely replace the deficient markings, as directed by the Engineer, within twenty (20) calendar days of written notification. Retroreflectivity and color may be checked after re-application of the pavement marking to ensure that segment meets the minimum values specified above.

If the Contractor does not complete the replacement of all of the deficient pavement markings by the end of the twenty (20) calendar day replacement period, the Contractor shall be subject to the liquidated damages as described within Section 108.7 of the West Virginia Division of Highway's Standard Specifications, at the discretion of the Project Engineer, until replacement is completed. These liquidated damages shall not stop during the winter shut-down period and shall be in combination with any other liquidated damages incurred.

No direct payment shall be made for the replacement of any deficient pavement marking during the warranty period as such work shall be considered as

incidental to the work as paid for by the various pavement marking items in the Contract.

INSERT THE FOLLOWING SECTION:

711.43 – WHITE OR YELLOW FAST-DRY TRAFFIC PAINT (TYPE X):

711.43.1 – General: The pavement marking material shall be formulated as a medium life pavement marking system capable of providing a minimum of two years of continuous performance as specified by the retroreflective parameters established within this contract. The pavement marking shall be a Fast-Dry, High-Build, Acrylic Waterborne product which utilizes a crosslink polymeric binder as an acrylic emulsion. This pavement marking material shall be lead free and be suitable for bituminous and concrete pavements. The material shall be capable of retaining reflective glass beads of the drop-on or spray-on type as specified by the bead manufacturer. The binder, as provided by the pavement marking manufacturer, shall incorporate Rohm and Haas HD-21A, Dow Chemicals UCAR Latex DT 400, or other Traffic Engineering Division approved equal. This material shall not be applied at less than 20 mil wet thickness. Other particulars concerning the composition of the paint shall be left to the discretion of the pavement marking manufacturer. The Contractor shall provide a pavement marking system to meet the performance requirements of the subsequent sections.

During the pavement marking warranty period, the pavement marking materials furnished and installed shall show no loss greater than five (5) percent due to tracking, chipping, spalling, poor adhesion to the pavement, and damage from traffic and normal wear. Loss due to pavement failure, unless caused by the marking material, will not be considered as a material failure and will not be included in the loss calculations and/or retroreflectivity readings There shall be no materials testing associated with this warranted pavement marking scheme, but the binder and bead type(s), application rate, and all other particulars shall be provided to the Engineer.

The pavement marking material shall have a homogeneous disbursement of color and beads when applied to the pavement. The material shall have a uniformly thick cross-section through its entire length.

The pavement marking material used shall be capable of being applied at a minimum ambient air temperature of fifty (50) degrees Fahrenheit.

The warranty and performance criteria of this specification shall apply to Type X markings placed on or after April 15th and prior to October 1st. Markings placed prior to April 15th, and on or after October 1st shall be exempt from the warranty and performance criteria of these specifications and shall not be considered for replacement based on the retroreflectivity and color requirements herein.

711.43.2 – Color and Retroreflectivity Requirements:

COLOR: After the application of the glass beads or other retroreflective elements, each color installed shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0.435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The color shall show no appreciable discoloration due to aging during the warranty period of this pavement marking. Pavement markings shall be visually checked by the Engineer at any time during the warranty period of this pavement marking. Additionally, the Engineer may at any time during the warranty period of this marking use a portable colorometer to determine if the markings have faded or darkened beyond the CIE Chromaticity Coordinate Limits. The Colormeter used shall be a LTL-Y or other hand held colormeter device approved by the Division.

RETROREFLECTIVITY: The pavement marking system installed shall maintain a minimum dry and Wet-Recovery (per ASTM specification 2177) reflectance value of 350 mcd/m2/lx for white pavement markings, and 275 mcd/m2/lx for yellow pavement markings for a minimum of 75 days. The material shall also maintain a minimum Wet-Continuous (per ASTM 2176) reflectance value of 100 mcd/m2/lx for white pavement markings, and 75 mcd/m2/lx for yellow pavement markings for a minimum of 75 days. After the initial 75 days, a minimum dry reflectance value of 175 mcd/m2/lx for white, and 150 mcd/m2/lx for yellow pavement markings shall be maintained for the remainder of the two year warranty period.

Readings are to be measured with a LTL-2000, or Traffic Engineering Division approved equal, 30 meter geometry retroreflectometer. A 5% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a hand held retroreflectometer. A 15% tolerance with the stated minimum required retroreflectivity values shall be allowed when tested with a mobile retroreflectometer.

711.43.3 - Sampling and Testing Procedures for Performance Samples: There may be periodic pavement marking reviews throughout the warranty period. These reviews will occur at any time after the markings have been placed. These reviews will evaluate the pavement marking material within the project limits for either day and night acceptability considering all requirements listed above. The following method will be used to measure the retroreflectivity acceptance of the pavement marking material:

- Locate and identify the starting point for measuring retroreflectivity of pavement markings for a roadway. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading. Repeat this procedure at each mile point in the project, taking 5 readings per line over a 1000 foot section (500 feet on either side of the mile point), and averaging. Samples should be spaced out evenly over the entire 1000 foot section.
- From each failed mile point, obtain an additional five readings for each failed line at a point 1/2 mile in each direction from the original failure point. Obtain five readings per line over a 1000 foot length of each line and calculate the average reading.
- If the readings at either 1/2 mile point from the original failure point fail, the Contractor shall be required to re-stripe the entire 1/2 mile section between the original failure point and the failed 1/2 mile point.
- If the readings at either 1/2 mile point from the original failed point pass, the Contractor shall be required to re-stripe a distance of ¼ mile from the original failed point in the direction of the passing ½ mile point.
- No readings shall be required to be taken between successive failing mile points and successive passing mile points. The Contractor shall be required to re-stripe the entire 1-mile section between successive failing mile points.
- If a project is less than one-mile in length, but longer than ½ mile, 20 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped. If a project is ½ mile or less in length, 10 readings shall be taken for each line, spaced out evenly over the length of the project, and averaged to determine if each line is required to be re-striped.

During the warranty period, if any markings along a 1,000 foot or more section of pavement are found to be deficient for any reason, the Contractor will be given notification stating the locations and the type of deficiency. These notifications will be given at any time within two (2) years of the initial installation of the markings. The Contractor shall completely replace the deficient markings, as directed by the Engineer, within twenty (20) calendar days of written notification. Retroreflectivity and color may be checked after re-application of the pavement marking to ensure that segment meets the minimum values specified above.

If the Contractor does not complete the replacement of all of the deficient pavement markings by the end of the twenty (20) calendar day replacement period, the Contractor shall be subject to the liquidated damages as described within Section 108.7 of the West Virginia Division of Highway's Standard Specifications, at the discretion of the Project Engineer, until replacement is completed. These liquidated damages shall not stop during the winter shut-down period and shall be in combination with any other liquidated damages incurred.

No direct payment shall be made for the replacement of any deficient pavement marking during the warranty period as such work shall be considered as incidental to the work as paid for by the various pavement marking items in the Contract.

SECTION 712
GUARDRAIL AND FENCE

ADD THE FOLLOWING SUBSECTION:

712.11 – SAFETY FENCE:

Safety Fence shall be orange in color, commercially manufactured from UV stabilized high-density polyethylene or a suitable substitute approved by the Engineer.

SECTION 713
METAL PIPE

713.9 - FULL BITUMINOUS COATED STRUCTURAL PLATE PIPE, PIPE ARCH, AND ARCHES:

DELETE THE ENTIRE SUBSECTION AND REPLACE WITH THE FOLLOWING:

These conduits shall conform to the requirements of AASHTO M 167 and shall be coated with bituminous material. When the coating can be applied in the shop it shall conform to the requirements of AASHTO M 190, Type A Coating. When the coating must be applied in the field the coating shall conform to the requirements of AASHTO M 243. The bituminous coating shall coat the entire inside and outside of the pipe and is not required between the metal sheets at the splices.

SECTION 714
CONCRETE, CLAY, FIBER AND PLASTIC PIPE

714.2 - REINFORCED CONCRETE CULVERT, STORM DRAIN AND SEWER PIPE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

This pipe shall conform to the requirements of AASHTO M 170 or ASTM C 76 and MP 711.03.30.

714.19 - CORRUGATED POLYETHYLENE PIPE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

For nominal pipe sizes of 3 to 6 inches (75 to 150 mm) when perforations are required the pipe shall meet the requirements of AASHTO M 252 with class 2 perforations.

For nominal pipe sizes of 3 to 10 inches (75 to 250 mm) when perforations are not required the pipe shall meet the requirements of AASHTO M 252 type "S" only.

For nominal pipe sizes of 12 to 48 inches (300 to 1 200 mm) the pipe shall meet the requirements of AASHTO M 294 type "S" or type "D" only.

714.22 - POLYVINYL CHLORIDE (PVC) PIPE:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

The pipe and fittings shall conform to the requirements of AASHTO M278, ASTM D3034 or ASTM F949.

714.23 - PRECAST REINFORCED CONCRETE BOX CULVERTS:

ADD THE FOLLOWING PARAGRAPH AT THE END OF THE SECTION:

All fabricators of precast reinforced concrete box culverts shall maintain an adequate level of quality control. Plant certification by NPCA (National Precast Concrete Association), ACPA (American Concrete Pipe Association) plant certification for box culverts, or other approved equal certification program will be required to verify this level of quality control. Plant approval must be obtained prior to the start of fabrication. All Fabricators shall then submit evidence of Plant approval to the MCS&T Division on an annual basis.

ADD THE FOLLOWING SECTION:

714.24 – NON-ASBESTOS FIBER-CEMENT STORM DRAIN PIPE:

This pipe shall conform to the requirements of ASTM C 1450, and the water used in the fabrication of this pipe shall meet the requirements of section 715.7.

SECTION 715
MISCELLANEOUS MATERIALS

INSERT THE FOLLOWING SECTION:

715.4 - CONCRETE REPAIR MATERIALS:

715.4.1 - Cementitious Materials for Concrete Repairs: Material to be used in concrete repair applications that will not be subjected to any type of loading for a minimum of 24 hours shall meet the minimum requirements of

ASTM C 928 with the exception of the requirements for consistency listed in Table 1.

715.4.2 - Non-Cementitious Materials for Concrete Repairs: This includes materials such as methyl methacrylate, polymer concrete, and other polymer/epoxy based materials used for concrete repairs. These materials will be evaluated and approved on a case-by-case basis. Follow preparation, mixing, and application procedures as prescribed in the specific material supplier's instructions.

715.11.6 – Engineering Fabric for Erosion Control:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Engineering fabric for erosion control shall meet the applicable requirements of AASHTO M 288, Section 7, Class 1.

715.11.8 – Engineering Fabric for Separation:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Engineering fabric for separation shall meet the applicable requirements of AASHTO M 288, Section 7, Class 2.

715.11.9 – Engineering Fabric for Stabilization:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Engineering fabric for stabilization shall meet the applicable requirements of AASHTO M 288, Section 7, Class 1.

ADD THE FOLLOWING SUBSECTION:

715.11.10 - Engineering Fabric for Pumped Sediment and Erosion Control (Dewatering Device): Each standard Dewatering Device shall have a fill spout large enough to accommodate a 4 inch (100 mm) discharge hose with attached straps to secure the hose and prevent pumped water from escaping without being filtered. The device must be able to accommodate a minimum flow rate of 1000 gal per minute (4 546 liters per minute) for the application for which it is to be used and a minimum size of 100 square feet (9 square meters).

The Dewatering Device shall be a nonwoven bag, which is sewn with a double needle stitching using a high strength thread.

The Dewatering Device seams shall have an average wide width strength per ASTM D 4884 of 100 LB/IN (1.15 kg/meter).

The geotextile fabric shall be nonwoven fabric with the following properties:

Properties	Test Method	English	Metric
Grab Tensile	ASTM D-4632	250 Lbs.	113 kg
Puncture	ASTM D-4833	165 Lbs.	75 kg
Flow Rate	ASTM D-4491	70 Gal/ Min/ Square Foot	25 liters/ Min/ Square meter
Permittivity	ASTM D-4491	1.3 Sec.-1	1.3 Sec.-1
Mullen Burst	ASTM D-3786	550 LBS. / square inch	3.79 MPa
UV Resistant	ASTM D-4355	70 %	70 %
AOS % Retained	ASTM D-4751	100 %	100 %

* All properties are minimum average roll value.

715.23 - GABIONS:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Welded wire fabric gabions shall conform to ASTM A974 and non-welded (twisted) wire mesh gabions shall conform to ASTM A975. Additionally, the use of fastener rings in the assembly of the gabion baskets may be permitted by the Engineer, providing the rings have at least the same tensile strength, zinc coating, and size as the wire used in the body of the gabion.

715.24.2-Permanent Erosion Matting:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

The matting shall consist of a machine produced mat of 100% ultraviolet stabilized polymeric or other suitable fibers resistant to degradation and having uniform thickness and mass per unit area throughout. The matting shall conform to the following:

Property[1]	Test Method	Type A	Type B	Type C
Minimum Mat Thickness	ASTM D1777	0.35 in. (9 mm)	0.50 in. (13 mm)	0.50 in (13 mm)
Minimum (Wide Width) Tensile Strength	ASTM D4595	145 x 110 lb/ft (2.16 x 1.6 kN/m)	170 x 130 lb/ft (2.5 x 1.5 kN/m)	3100 x 2000 lb/ft (45 x 29 kN/m)
Maximum Elongation	ASTM D4595	50%	50%	50%
Minimum Porosity (Calculated)		95%	95%	95%
Resiliency	ASTM D1777	80%	80%	80%
Ultraviolet Stability	ASTM D4355	80%	80%	80%

[1] Property values are reported as minimum average roll values (MARV)

Tractive Force (Shear Stress) Performance Specification

Type A Matting shall have the ability to prevent soil loss where the maximum channel shear stress ranges from 0-4 lb/ft^2 (0-20 kg/m^2) in a vegetated state, @ 0.5 hours peak flow duration.

Type B Matting shall have the ability to prevent soil loss where the maximum channel shear stress ranges from 0-6 lb/ft^2 (0-29 kg/m^2) in a vegetated state, @ 0.5 hours peak flow duration.

Type C Matting shall have the ability to prevent soil loss where the maximum channel shear stress ranges from 0-8 lb/ft^2 (0-39 kg/m^2) in a vegetated state, @ .5 hours peak flow duration.

715.24.3 - Acceptance:

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Acceptance of temporary erosion control matting shall be based upon the manufacturer's written certification that the erosion control mat used is well suited to the particular site to be protected and upon the Division's visual inspection of the material. Acceptance of permanent erosion control matting shall be based upon certified test data with each shipment of matting. Compliance of this data with the requirements specified will be the basis of acceptance.

715.25 - GROUND AGRICULTURAL LIMESTONE:

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

Ground agricultural limestone shall consist of high calcitic or dolomitic limestone containing not less than 85% of total calcium and magnesium carbonates, ground to such fineness and clearly labeled in accordance with the requirements of the West Virginia Department of Agriculture. Ground agricultural limestone shall be furnished and used in accordance with State Laws. Suppliers must be registered with the West Virginia Department of Agriculture.

715.40-PAVEMENT MARKING MATERIAL

715.40.2-Preformed Traffic Markings

DELETE THIS SUBSECTION AND REPLACE WITH THE FOLLOWING:

715.40.2-Preformed Traffic Markings (Type V Material): The markings described are preformed, retroreflective pavement markings conforming in color,

size and shape to the West Virginia Department of Transportation, Division of Highways' Standard Details Book, Vol. II, and to the Federal Highway Administration's Standard Alphabets for Highway Signs and Pavement Markings.

Preformed thermoplastic traffic markings shall be fabricated to a uniform thickness of not less than 125 mils, including retroreflective beads. Preformed pavement marking tapes, applied as Type V material, shall be fabricated such that no portion of the material profile is less than 60 mils, including adhesive and retroreflective beads.

As a minimum, preformed thermoplastic traffic markings shall be capable of being applied to clean road surfaces at a minimum temperature of 35 degrees Fahrenheit (road surface and ambient air), with a surface primer if necessary, providing moisture has been sufficiently removed from the application surface.

As a minimum, preformed pavement marking tapes applied as Type V material shall be capable of being applied to clean road surfaces, with a surface primer if necessary, when the following conditions are met:

- Road surface is dry
- Ambient air temperature 60 degrees Fahrenheit and rising
- Road surface temperature 70 degrees Fahrenheit and rising
- No rainfall 24 hours prior to application
- Minimum air temperature overnight prior to application 40 degrees Fahrenheit

715.40.2.1 – Contractor's/Manufacturer's Warranty and Adherence, Retroreflectivity, Color, and Road Presence Requirements: Transverse markings shall be warranted by the Contractor/Manufacturer to adhere to both asphalt and concrete, maintain road presence, and meet the retroreflectivity and color requirements described herein, for a minimum of three (3) years when applied according to the Manufacturer's recommendations. Transverse markings shall include stop bars, yield bar markings, legend, symbols such as lane assignment arrows and lane drop arrows, railroad crossing markings, crosswalk markings, stripes inside lane shunts and gore areas, and other similar markings.

Longitudinal lines shall be warranted by the Contractor/Manufacturer to adhere to both asphalt and concrete, maintain road presence, and to meet the retroreflectivity and color requirements described herein, for a minimum of four (4) years when applied according to the Manufacturer's recommendations. Longitudinal lines shall include lane lines, barrier lines, channelizing lines, edge lines, and other similar markings.

RETROREFLECTIVITY: Both white and yellow markings shall be warranted by the Contractor/Manufacturer to maintain a minimum retroreflectivity level of 150 millicandelas, with beads applied, for the applicable warranty period described above.

All retroreflectivity measurements will be taken with a LTL 2000, or other Traffic Engineering Division approved 30-meter geometry retroreflectometer. A 5% tolerance with the stated minimum required retroreflectivity value shall be allowed when tested with a hand held retrorelfectometer. Average retroreflectance

values shall be determined by following an adequate sampling plan to be determined by the Division.

Generally, conformance of markings with the retroreflectivity requirement shall be based on a well dispersed sampling, to be determined by the Division, of the retroreflectivity over the whole marking. Retroreflectivity sampling may be concentrated on a specific area of the marking that appears to be in non-compliance with the Road Presence requirement for the purpose of determining non-compliance with quantitative data.

COLOR: Each color installed shall be warranted by the Contractor/Manufacturer to fall within the boundaries created by the following CIE Chromaticity Coordinate Limits, with beads applied, for the applicable warranty period described above:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The colormeter used shall be a LTL-Y, or other hand-held colormeter device approved by the Division. Average color coordinate values shall be determined by following an adequate sampling plan to be determined by the Division.

Generally, conformance of markings with the color requirements shall be based on a well dispersed sampling, to be determined by the Division, of the color values over the whole marking. Color sampling may be concentrated on a specific area of the marking that appears to be in non-compliance with the Road Presence requirement for the purpose of determining non-compliance with quantitative data.

ADHERENCE AND ROAD PRESENCE: Both white and yellow markings shall be warranted by the Contractor/Manufacturer to maintain adherence and road presence for the applicable warranty period described above.

The Adherence and Road Presence requirement shall apply to materials worn uniformly, from the surface down, by normal traffic and snow-plowing. In addition, these requirements shall apply to materials at intersections subject to turning movements by normal traffic. However, these requirements shall not apply in cases of damage attributable to snow-plowing such as chiseling, cutting, chipping, or in cases of material removal from the roadway (other than removal from the surface down due to normal wearing as described above) when it can be shown that the material removal is due to snow-plowing rather than material adhesion failure. Loss due to pavement failure, unless caused by the marking material, will not be considered as a material failure.

715.40.2.2 – Approved Products Listing: Material approvals are based on results from AASHTO's NTPEP testing program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved materials, code numbers, and approved Contractor personnel may be obtained by contacting:

Materials Control, Soils, & Testing Division
190 Dry Branch Road
Charleston, West Virginia 25306

ADD THE FOLLOWING SUBSECTION:

715.40.3-Interim Pavement Markings (Type VIIA Interim Pavement Marking Tape)

715.40.3.1 - Interim Pavement Markings (Type VIIA): This specification describes a interim pavement marking tape, to be placed immediately after paving operations are completed, and prior to the opening of the roadway to traffic, as described in Section 401.11. The material shall be designed to be inlaid and used in place of centerlines and lane lines until temporary edge lines, centerlines, and lane lines are placed as described in Section 636.8, within the time period specified in Section 401.11.

715.40.3.1.1 – Requirements – Any material not meeting the following requirements shall not be placed by the Contractor. If placed, the material shall be removed and replaced by the Contractor:

i. **Composition:** This material shall consist of a white or yellow weather and traffic resistant reflective film on a conformable backing precoated with a pressure sensitive adhesive.
ii. **Color:** The marking material shall be white or yellow color, as specified, and shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits until temporary markings are placed:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The Colormeter used shall be a LTL-Y, or other hand-held colormeter device approved by the Division. Average color coordinate values shall be determined by following an adequate sampling plan to be determined by the Division.

iii. **Retroreflection:** The marking material shall be visibly retroreflective, under both dry conditions and conditions of moderate rainfall, when inlaid on bituminous concrete surfaces. The markings shall be readily visible, through the

interim period prior to the placement of temporary markings, when viewed with automobile headlights at night.

iv. **Adhesive:** The marking material shall have a precoated pressure sensitive adhesive and require no activation (primer). If necessary, the adhesive shall be protected prior to application with a removable liner to prevent contamination during processing, cutting, and handling. The liner shall release from the adhesive easily, without splitting or tearing, and shall not shrink or prematurely release from adhesive during processing, storage, or handling.

v. **Storage Life:** The material shall not be used after being stored beyond the manufacturer's recommended storage life. The material shall have a minimum storage life of one (1) year.

vi. **General:** The pavement marking material as supplied shall be of good appearance, and free from cracks. Edges shall be true, straight, and unbroken.

vii. **Approved Suppliers:** The material must perform successfully in the Division's field evaluation test. The Division reserves the right to remove products from the approved list based on actual field performance. A list of approved suppliers and their code numbers may be obtained by contacting:

West Virginia Division of Highways
Material Controls, Soil and Testing Division
190 Dry Branch Road
Charleston, WV 25306

ADD THE FOLLOWING SUBSECTION:

715.40.4 - Temporary Pavement Marking Tape (Types VIIB and VIIC)

715.40.4.1 - Deleted

715.40.4.2 - Temporary Pavement Markings (Type VIIB): This specification describes a removable pavement marking consisting of a film designed to be used as temporary lines. The temporary pavement markings shall be white or yellow as denoted on the Plans or required by the MUTCD.

715.40.4.2.1 – Requirements – Any material not meeting the following requirements shall not be placed by the Contractor. If placed, the material shall be removed and replaced by the Contractor:

i. Composition: The removable preformed plastic pavement marking film shall consist of a mixture of polymeric materials, pigments, nonmetallic reinforcing medium to facilitate removal, and reflective beads or elements.

ii. Color: Color pigments shall be thoroughly blended to provide a plastic marking film that maintains uniform color under both daylight and night lighting conditions throughout the expected life of the film. Each color installed shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits, with beads applied, while in place for any time period from April 1st to November 1st:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The Colormeter used shall be a LTL-Y, or other hand-held colormeter device approved by the Division. Average color coordinate values shall be determined by following an adequate sampling plan to be determined by the Division.

iii. Application Requirements: As a minimum, Type VIIB materials shall be capable of being applied to clean road surfaces, with a surface primer if necessary, when the following conditions are met:
- Road surface is dry
- Ambient air temperature 50 degrees Fahrenheit and rising
- Road surface temperature 50 degrees Fahrenheit and rising
- No rainfall 24 hours prior to application
- Minimum air temperature overnight prior to application 40 degrees Fahrenheit

iv. Adhesive: The removable preformed plastic pavement marking film shall be pre-coated with a pressure sensitive adhesive capable of being affixed to bituminous concrete and Portland cement concrete pavement surfaces without the use of heat. An additional adhesive primer or activator is allowable and may be required under certain weather conditions, per the manufacturer's recommendations. The adhesive shall exhibit excellent shear characteristics and minimal tensile characteristics. The adhesive shall not require a protective liner when the preformed plastic pavement marking film is in rolled form for shipment.

v. Storage Life: The material shall not be used after being stored beyond the manufacturer's recommended storage life. The material shall have a minimum storage life of one (1) year.

vi. Thickness: The removable plastic marking film shall be manufactured such that no portion of the material profile is less than 30 mils, including adhesive and retroreflective beads.

vii. Skid Resistance: The surface for the retroreflective preformed plastic pavement marking film shall provide a minimum skid resistance value of 50 BPN when tested in accordance with ASTM E 303.

viii. Removability: While in place for any time period from April 1st to November 1st, the preformed plastic pavement marking film shall be removable from bituminous concrete and Portland cement concrete in its entirety, either manually or by a mechanical roll-up device, at temperatures above 40 degrees Fahrenheit (ambient and road surface temperature), and without the use of heat, solvents, grinding, or blasting.

ix. Retroreflectvity: The markings shall be capable of maintaining a minimum average retroreflective performance level of 150/ mcd/m2/lx, while in place for any time period from April 1st to November 1st, when installed according to the manufacturer's recommendations. All retroreflectivity measurements will be taken with a LTL 2000, or other Traffic Engineering Division approved 30-meter

geometry retroreflectometer. Average retroreflectance values shall be determined by following an adequate sampling plan to be determined by the Division.

x. General: The pavement marking material as supplied shall be of good appearance, and free from cracks. Edges shall be true, straight, and unbroken.

xi. Approved Products Listing (APL): Approvals are based on results from AASHTO's NTPEP testing program and/or WVDOH field evaluation tests. Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

West Virginia Division of Highways
Material Controls, Soil and Testing Division
190 Dry Branch Road
Charleston, WV 25306

715.40.4.3 – Temporary Pavement Markings (Type VIIC): This specification describes a removable pavement marking consisting of a film designed to be used for temporary lines. The temporary marking retroreflective performance level shall not be affected in a "wet" condition, as defined in this specification. The temporary markings shall be white or yellow as denoted on the plans or required by the MUTCD.

715.40.4.3.1 – Requirements – Any material not meeting the following requirements shall not be placed by the Contractor. If placed, the material shall be removed and replaced by the Contractor:

i. Composition: The removable preformed plastic pavement marking film shall consist of a mixture of polymeric materials, pigments, nonmetallic reinforcing medium to facilitate removal, a thin, flexible, conformable backing, and reflective beads or elements.

ii. Color: Each color installed shall fall within the boundaries created by the following CIE Chromaticity Coordinate Limits, with beads applied, while in place for any time period from April 1st to November 1st:

COLOR	CIE CHROMATICITY COORDINATE LIMITS							
	1		2		3		4	
	X	Y	X	Y	X	Y	X	Y
White	0.480	0.410	0.430	0.380	0.405	0.405	0.455	0435
Yellow	0.575	0.425	0.508	0.415	0.473	0.453	0.510	0.490

The Colormeter used shall be a LTL-Y, or other hand-held colormeter device approved by the Division. Average color coordinate values shall be determined by following an adequate sampling plan to be determined by the Division.

iii. Application Requirements: As a minimum, Type VIIC materials shall be capable of being applied to clean road surfaces, with a surface primer if necessary, when the following conditions are met:

- Road surface is dry
- Ambient air temperature 50 degrees Fahrenheit and rising
- Road surface temperature 50 degrees Fahrenheit and rising
- No rainfall 24 hours prior to application
- Minimum air temperature overnight prior to application 40 degrees Fahrenheit

iv. Adhesive: The removable preformed plastic pavement marking film shall be pre-coated with a pressure sensitive adhesive capable of being affixed to bituminous concrete and Portland cement concrete pavement surfaces without the use of heat. An additional adhesive primer or activator is allowable and may be required under certain weather conditions, per the manufacturer's recommendations. The adhesive shall exhibit excellent shear characteristics and minimal tensile characteristics. The adhesive shall not require a protective liner when the preformed plastic pavement marking film is in rolled form for shipment.

v. Storage Life: The material shall not be used after being stored beyond the manufacturer's recommended storage life. The material shall have a minimum storage life of one (1) year.

vi. Thickness: The removable plastic marking film shall be manufactured such that no portion of the material profile is less than 30 mils, including adhesive and retroreflective beads.

vii. Skid Resistance: The surface of the marking shall provide a minimum skid resistance value of 50 BPN when tested in accordance with ASTM E 303.

viii. Removability: While in place for any time period from April 1st to November 1st, the preformed plastic pavement marking film shall be removable from bituminous concrete and Portland cement concrete in its entirety, either manually or by a mechanical roll-up device, at temperatures above 40 degrees Fahrenheit (ambient and road surface temperature), and without the use of heat, solvents, grinding, or blasting.

ix. Wet Reflective Performance: The visual performance of the marking in wet and dry conditions shall be nearly identical. For visual evaluation purposes, the marking material shall be considered to be in a "wet" condition when a layer of water completely covers the top surface of the material. The layer of water shall measure a minimum of ¼ inch from the highest profile point of the material to the top surface of the water layer.

x. Retroreflectivity: The markings shall be capable of maintaining a minimum average retroreflective performance level of 200/ mcd/m2/lx, while in place for any time period from April 1st to November 1st, in both dry and wet conditions when installed according to the manufacturer's recommendations. Retroreflectance shall be measured in accordance with ASTM specifications E 2176 and/or E 2177 to determine the markings retroreflectivity in wet conditions. Average retroreflectance values shall be determined by following an adequate sampling plan to be determined by the Division. All retroreflectivity measurements will be taken with a LTL 2000 (dry condition), LTL-X (wet conditions), or other Traffic Engineering Division approved 30-meter geometry retroreflectometer.

xi. General: The pavement marking material as supplied shall be of good appearance, and free from cracks. Edges shall be true, straight, and unbroken.

xii. Approved Products Listing (APL): Approvals are based on results from AASHTO's NTPEP testing program and/or WVDOH field evaluation tests.

Approvals may also be granted or rescinded based on actual performance on WVDOH projects. A list of approved suppliers and their code numbers may be obtained by contacting:

West Virginia Division of Highways
Material Controls, Soil and Testing Division
190 Dry Branch Road
Charleston, WV 25306

715.41 – TRAFFIC SAFETY DEVICES:

DELETE SUBSECTION 715.41.5 AND REPLACE WITH THE FOLLOWING:

715.41.5 – Reusable Energy Absorbing Crash Terminal Device (Type I):

715.41.5.1 – Description: The unit shall consist of high-density polyethylene cylinders, which will compress and absorb energy. In addition, these cylinders under most circumstances will recover their shape, position, and absorption capabilities sufficiently enough, after being impacted by a vehicle, to withstand another impact by a vehicle. Each cylinder shall be 24" (611 mm) to 36" (908 mm) in outside diameter and 32" (813 mm) to 48" (1 220 mm) high. Cylinder color shall be black. Cylinder Units shall have a cover. The unit shall have a restraining cable system of heavy steel galvanized wire rope on each side of the row of cylinders.

715.41.5.2 – Performance: The unit shall be capable of attenuating head-on hits and redirecting 1800 lbs. (820 Kg) to 4409 lbs. (2 000 kg) vehicles which impact the unit of speeds up to 55 MPH (88 KPH). The device shall meet all evaluation criteria specified by NCHRP 350, including occupant risk, structural integrity, and post-impact trajectory.

ADD THE FOLLOWING SUBSECTION:

715.41.6 –Trinity Attenuating Crash Cushion (Type II):

715.41.6.1 - Description: The unit shall consist of a pair of guidance tracks, an impact "sled," intermediate steel frames, and 10 gauge W-Beam fender panels. The overall width should be 24 inches (610 mm). The guidance tracks are made from two C-channels formed into a box section by variable lengths and thicknesses of metal rip plates bolted to the outside flanges of the channels. The sled, or impact face, of the TRACC is positioned over the upstream end of the guidance tracks and contains a hardened steel blade which cuts the metal plates on the sides of the guidance tracks as it is forced backwards in an end hit. The intermediate frames support the W-beam fender panels and are free to slide backwards when the TRACC is hit on the end, but lock onto the guidance tracks to provide redirection for side impacts.

The fender panels are bolted to the intermediate frames with a design that locks the inside panels in place while allowing the outer panels to slide back freely as the system telescopes rearward.

715.41.6.2 - Performance: The unit shall be capable of attenuating head-on hits redirecting 1,800 lbs. (820 kg) to 4,409 lbs. (2 000 kg) vehicles which impact the unit of speeds up to 62 MPH (100 KPH). The device shall meet all evaluation criteria specified by NCHRP 350.

ADD THE FOLLOWING SUBSECTION:

715.41.7 – Acceptance: Acceptance shall be based upon review and approval of the certified crash test data by the division. Materials Control, Soils, and Testing Division shall develop an approved list of Traffic Safety Devices.

715.42 – TRAFFIC SIGNAL MATERIALS AND EQUIPMENT:

715.42.9 – Signal Supports:

715.42.9.1 – Mast Arm Signal Supports (Type A1, A1L, A2, A2L, B1 and B1L):

715.42.9.1.4 – Materials Incorporated into the Support:

DELETE THE SECOND PARAGRAPH AND REPLACE WITH THE FOLLOWING:

All steel tubes for arms and poles shall be fabricated from ASTM A595, Grade A or A1011, Grade 55, Class 2 or A572, Grade 55.

715.42.9.1.4 – Material Incorporated Into The Support:

DELETE THE FIRST SENTENCE OF THE FOURTH PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Anchor bolts shall be fabricated from steel meeting the requirements of ASTM F 1554, Grade 55.

715.42.9.2 – Strain Pole Signal Supports (Types C1, C1L, C2 and C2L):

715.42.9.2.2 – Materials Incorporated into the Support:

DELETE THE SECOND PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

The upright shaft shall be fabricated from ASTM A595, Grade A or A1011, Grade 55, Class 2 or A572, Grade 55. The minimum wall thickness shall be 0.1793 in. (7 gage) (4.55 mm).

715.42.9.2.2 – Material Incorporated into the Support:

DELETE THE FIRST SENTENCE OF THE FOURTH PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Anchor bolts shall be fabricated from steel meeting the requirement of ASTM F 1554, Grade 55.

715.42.9.4.1 - Type E1:

DELETE THE FIRST SENTENCE OF THE THIRD PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Anchor bolts shall be fabricated from steel meeting the requirement of ASTM F 1554, Grade 55.

715.42.9.4.2 – Type E2:

DELETE THE FIRST SENTENCE OF THE THIRD PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Anchor bolts shall be fabricated from steel meeting the requirements of ASTM F 1554, Grade 55.

715.42.9.4.3 – Type E3:

DELETE THE FIRST SENTENCE OF THE THIRD PARAGRAPH AND SUBSTITUTE THE FOLLOWING:

Anchor bolts shall be fabricated from steel meeting the requirements of ASTM F 1554, Grade 55.

SECTION 716
EMBANKMENT AND SUBGRADE MATERIAL

716.1.1.2 - Granular Material:

INSERT THE FOLLOWING AFTER THE LAST SENTENCE OF THE FIRST PARAGRAPH:

The contractor's gradation data shall be evaluated in accordance with applicable sections of Section 307 except that Table 704.6.2 shall not apply. Gradation limits shall be in accordance with Table 703.4.

SECTION 717
COMPACTION CONTROL OF BASE COURSE MATERIAL

DELETE THE ENTIRE SECTION AND REPLACE WITH THE FOLLOWING:

717.1 - GENERAL:

The Contractor shall notify the Engineer prior to construction of the test strips as set forth in MP 700.00.24. The Contractor shall perform quality control compaction tests and record the data on the forms as set forth in the Materials Procedures (MPs). The test data shall be available to the Engineer at the time of testing or as indicated in the Contractor's quality control plan.

717.2 - TEST METHODS:

Maximum density, quality control density and acceptance density for crushed aggregate base course and aggregate subbase shall be determined in accordance with MP 700.00.24.

717.3 - DENSITY:

The crushed aggregate base course and aggregate subbase shall be compacted to the target percentage of dry density of 95%. The maximum required dry density shall be determined in accordance with MP 700.00.24 Part I on a control test strip having a compacted thickness of 6 inches (150 mm) or less. The in-place dry density of each base course layer shall be determined in accordance with MP 700.00.24 Part II. The maximum layer thickness, other than the test strip(s), shall not exceed 12 in. (300 mm) or as specified in the project documents. The density of layers with thickness that differ from the thickness of the control test strip(s) shall be subject to the density requirements determined by the control test strip.

SECTION 718
SEWER AND WATERLINE MATERIAL

718.5 - PLASTIC PIPE (PVC)

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Plastic Pipe shall conform to the following requirements unless otherwise specified by the Utility responsible for its operation:

Pipe Size	Pressure Applications	Non-Pressure Applications
Less than 4 in (100 mm)	ASTM D2241, SDR 21	ASTM D3034
4 in (100 mm) to 12 in (300 mm)	AWWA C900, DR 14	ASTM D3034
14 in (350 mm) to 16 in (400 mm)	AWWA C905, DR 14	ASTM D3034
Joint Requirements	ASTM D3139	ASTM D3212

718.7 - PLASTIC PIPE (POLYETHYLENE):

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Plastic pipe (polyethylene) shall conform to ASTM D2239 "PE3408". Additionally, when used for potable water, polyethylene pipe shall be approved by the National Sanitation Foundation for use in transmitting liquids for human consumption.

718.10 - GATE VALVES

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Gate valves shall conform to AWWA C500 or C509.

718.15 - MISCELLANEOUS STEEL (CLAMPS, RODS, ETC.):

DELETE THE CONTENTS AND REPLACE WITH THE FOLLOWING:

Miscellaneous Steel (Clamps, Rods, Etc.) shall be industrial quality.

718.20-FINE AGGREGATE:

DELETE THE CONTENTS AND SUBSTITUTE THE FOLLOWING:

Fine aggregate used to level the bedding material shall consist of crushed or uncrushed mineral aggregate which has no particles larger than 3/8 in. (9.5 mm) as determined by visual inspection. The project Engineer/Supervisor may obtain samples on questionable materials for testing prior to use.