

South Dakota Department of Transportation
Minimum Sample and Test Requirements (MSTR)

Table of Contents

		<u>Page</u>
1.	Asphalt Construction:	1
1.1	Asphalt Concrete, Hot Mix	
	A. Aggregate, Composite	3
	B. Rock, Sand, Filler, etc.	4
	C. Asphalt Binder	4
	D. Asphalt Binder Content.....	5
	E. RAP Content.....	6
	F. RAP in Asphalt Concrete.....	6
	G. Lime Content	6
	H. Density, In-Place	7
	I. Density, Standard	7
	J. Bulk Specific Gravity, Mixture Densification, Voids in Mineral Aggregate and Dust to Binder Ratio	8
	K. Moisture Content of Mix.....	8
	L. Drain Down	8
1.2	Cold In-Place Recycling	
	A. Aggregate	9
	B. Density Standard	9
	C. Density In-Place	9
	D. Moisture Content (Prior to Compaction).....	10
	E. Moisture Content (After Compaction).....	10
1.3	Asphalt Surface Treatment	
	A. Cover Aggregate, Types 1 & 2 and Mineral Aggregate for Microsurfacing	10
	B. Cover Aggregate, Type 3	11
1.4	Asphalt Liquid	
	A. Material	11
1.5	Crack Sealing of Asphalt Concrete	
	A. Sealant.....	12
	B. Backer Rod	12
1.6	Milling (Surface Texture)	
	A. Cold Milling	12
	B. Micro-Milling	13
2.	Subbase, Base Course, and Cushion Construction:	14
2.1	Untreated Subbase, Base Course, and Cushion	
	A. Aggregate, Composite	14
	B. Rock, Clay, Sand Filler, etc.	15
	C. Density, In-Place (Excludes Gravel Cushion)	15
	D. Density, Standard (Excludes Gravel Cushion)	15

2.2 Asphalt Treated Subbase, Base Course, and Cushion (Cold Mix)

- A. Aggregate, Composite-Uncoated 16
- B. Rock, Clay, Sand, Filler, etc. 16
- C. Asphalt 16
- D. Asphalt Content 17
- E. Density, In-Place 17
- F. Density, Standard 17

3. Miscellaneous Granular Materials: 18

- 3.1 Gravel and Sand for Maintenance Stockpiles
 - A. Aggregate 18
- 3.2 Gravel Surfacing
 - A. Aggregate 18
 - B. Rock, Stone, Sand, Clay, etc. 18
- 3.3 Blotting Sand for Prime Coat and Sand for Flush Seal
 - A. Aggregate 19
- 3.4 Bridge End Backfill
 - A. Aggregate 19
 - B. Density, In-Place 19
- 3.5 Gabion Fill (Rock or Stone)
 - A. Aggregate 19
- 3.6 Porous Backfill
 - A. Aggregate 20
- 3.7 Riprap
 - A. Aggregate 20
- 3.8 Pit Run
 - A. Aggregate 21
 - B. Density, In-Place 21
 - C. Density, Standard 21
- 3.9 Slope Protection Aggregate
 - A. Aggregate 22
- 3.10 Base Course Salvaged and Full Depth Reclamation Materials
 - A. Aggregate 22
 - B. Density, In-Place 22
 - C. Density, Standard 23
- 3.11 Pipe and Box Culvert Undercut Backfill (Granular)
 - A. Aggregate 23
 - B. Density, In-Place 23
 - C. Density, Standard 24
- 3.12 Cold Milled Asphalt Concrete and Placing Cold Milled Material
 - A. Milled Material 24

- 3.13 MSE Backfill
 - A. Aggregate24
- 3.14 Miscellaneous Granular Materials (Box Culvert Bedding/etc. when Specifications are noted)
 - A. Aggregate25
- 4. Subgrade Construction (Embankments):.....26**
 - 4.1 Specified Density (In-Place)
 - A. Embankment (Includes Subgrade Topping, Ordinary, and Heavy Roadway Shaping)27
 - B. Berms28
 - C. Bridge End Embankment.....28
 - D. Cross Pipe Pre-Installation Density/Undercut (Does not include utility, storm sewer, gas, or water main).....28
 - E. Pipe Undercut Backfill (Soil).....29
 - F. Pipe and Box Culvert Backfill29
 - G. Density, Standard (Target)30
 - 4.2 Ordinary Compaction Method
 - A. Density.....31
 - B. Density, Standard (Target)31
 - 4.3 Moisture Content
 - A. Embankment (Includes Select Subgrade Material, Berms, Box Culvert, and Pipe Backfill; Excludes Ordinary Compaction)31
 - B. Moisture, Standard (Target)32
- 5. Portland Cement Concrete Paving Construction:33**
 - 5.1 Materials
 - A. Aggregate, Fine and Coarse34
 - B. Aggregate, Fine and Coarse, Moisture Content.....35
 - C. Cement35
 - D. Water35
 - E. Chemical Admixtures (Includes Air Entraining, Water Reducing, Accelerators, Retarders, etc.).....36
 - F. Fly Ash.....36
 - 5.2 Strength Tests
 - A. Compressive Strength36
 - 5.3 Fresh (Plastic) Concrete Tests
 - A. Air Content, Unit Weight, Slump, and Temperature37
 - 5.4 Measurements
 - A. Longitudinal Surface38
 - B. Texture.....38
 - C. Thickness.....38
 - D. Width.....39
 - 5.5 Curing Materials
 - A. Liquid Membrane Curing Compound39
 - B. Burlap and Cotton Mat.....39
 - C. Polyethylene Sheeting.....40

- 5.6 Joint Materials
 - A. Preformed Expansion Type (Includes Non-Extruding and Resilient Bituminous and Non-Bituminous Types) 40
 - B. Hot Poured Elastic Type 40
 - C. Backer Rod (Hot Pour) 41
 - D. Silicone 41
 - E. Backer Rod (Silicone) 41
- 5.7 Keyways
 - A. Material 42
- 6. Portland Cement Concrete Structure Construction: 43**
 - 6.1 Materials
 - A. Aggregate, Fine and Coarse 43
 - B. Aggregate, Fine and Coarse, Moisture Content 44
 - C. Cement 45
 - D. Water 45
 - E. Chemical Admixtures (Includes Air Entraining, Water Reducer, Accelerators, Retarders, etc.) 45
 - F. Fly Ash 46
 - 6.2 Strength Tests
 - A. Compressive Strength 46
 - 6.3 Fresh (Plastic) Concrete Tests
 - A. Air Content, Unit Weight, Slump, and Temperature 47
 - 6.4 Curing Materials
 - A. Liquid Membrane Curing Compound 47
 - B. Burlap 48
 - C. Film (Sheet Materials Including Water Proof Paper, Polyethylene Sheeting, White Burlap-Polyethylene Sheeting, Etc.) 48
 - 6.5 Joint Materials
 - A. Strip Seal and Preformed Elastomeric Open Cell Compression Type with Lubricant/Adhesive 48
 - B. Preformed Expansion Type (Includes Non-Extruding and Resilient Bituminous and Non-Bituminous Types) 49
 - C. Hot Poured Elastic Type 49
 - D. Silicone 49
 - E. Backer Rod 50
 - 6.6 Commercial Textured and Special Surface Finish
 - A. Materials 50
 - 6.7 Abutment Backwall Coating
 - A. Materials 50
 - 6.8 Measurement of Texture
 - A. Tined Surface 51
 - 6.9 Measurement of Deck Roughness
 - A. Surface 51

7. Portland Cement Concrete Miscellaneous Construction – Class M52

7.1 Materials and Plant52

 A. Requirements52

 B. Preformed Expansion Type Joint Material (Includes Non-Extruding and Resilient Bituminous and Non-Bituminous Types)52

8. Roadway Lighting and Traffic Control:53

8.1 Materials53

 A. Standard Items of Electrical Equipment53

 B. Miscellaneous Hardware Items53

 C. Items that are on the Approved Products List (APL)54

 D. Items Requiring Approval of Catalogue Cuts or Shop Drawings54

 E. Items Requiring an Umbrella Certificate for the Material55

 F. Lighting and Signal Anchor Bolts, Nuts & Washers55

 G. High-Strength Bolts56

9. Roadside Development:57

9.1 Materials57

 A. Burlap, Excelsior Blanket, and Erosion Control Blanket (Includes Fasteners)57

 B. Fertilizer57

 C. Fiber Mulch57

 D. Seeds.....58

 E. Mulch58

10. Buildings and Rest Area Construction:59

10.1 Materials59

 A. Brick.....59

 B. Insulation59

 C. Building Block (Hollow or Solid).....60

 D. Basin and Manhole Block.....60

 E. Miscellaneous Hardware Items60

11. Miscellaneous Incidental and Manufactured or Fabricated Items:61

11.1 Aluminum61

 A. Cast, Framing, Handrail, Hardware, and Sheet (Includes Extruded Types)61

11.2 Bearing Pads61

 A. Bronze or Copper61

 B. Canvas and Red Lead.....61

 C. Elastomeric61

 D. Neoprene62

 E. Fabric (Preformed)62

11.3 Bridge Deck Drains62

 A. Material.....62

11.4	Castings and Cast Iron	
	A. Bridge Hardware.....	63
	B. Drop Inlet Frames, Grates, Box Curb Assemblies, etc.	63
	C. Grid Floor.....	63
11.5	Cattle Guards	
	A. Material.....	63
11.6	Chloride	
	A. Calcium, Sodium, and Magnesium.....	64
11.7	Epoxy-Resin Adhesive	
	A. Material.....	64
11.8	Fencing	
	A. Barb Wire.....	64
	B. Chain-Link System (Includes Fabric, Posts, Rails, Fittings, And Hardware)	65
	C. Woven Wire	65
	D. Brace Wire.....	65
	E. Miscellaneous Fasteners, Staples, Ties, etc.	66
	F. Gates (Tubular Frame).....	66
	G. Steel Posts	66
	H. Wood Posts	66
11.9	Glass Beads	
	A. Material.....	67
11.10	Paint	
	A. Traffic Marking Paint (Regular & Epoxy)	67
	B. Bridge Paint and Primer	68
	C. Bridge Field Painting – Surface Preparation	68
	D. Bridge Field Painting – Paint Application	68
11.11	Permanent Plastic Pavement Markings	
	A. Material.....	68
11.12	Piling	
	A. Pre-Cast and Pre-Stressed Concrete.....	69
	B. Steel Beam or Sheet (Includes Corrugated)	69
	C. Timber (Treated).....	69
	D. Piling Shoes.....	70
11.13	Pipe	
	A. Concrete	70
	B. Corrugated Metal.....	70
	C. PVC	71
	D. Polyethylene Underdrain	71
	E. High-Density Polyethylene	71
11.14	Pre-Cast and Pre-Stressed Concrete	
	A. Aggregate, Fine and Coarse	72
	B. Cement.....	72
	C. Chemical Admixtures (Includes Air Entraining, Water Reducer, Accelerators, Retarders, etc.).....	72
	D. Fly Ash.....	73

- E. Water 73
- F. Concrete, Strength Tests..... 73
- G. Fresh (Plastic) Concrete Tests. (Air Content, Unit Weight, Slump, and Temperature)..... 74
- H. Metal Components 74

- 11.15 Miscellaneous Precast Concrete Products 75
 - A. Material 75

- 11.16 Signing Materials 75
 - A. Aluminum (Sheet and Extruded) 75
 - B. Signing Anchor Bolts, Nuts & Washers 76
 - C. High-Strength Bolts 76
 - D. Posts 76
 - E. Reflective Sheeting..... 77

- 11.17 Steel 77
 - A. Bolt Assemblies (Bolts, Nuts, Washers, and Direct Tension Indicators, (If required)). 77
 - B. Guardrail Cable 79
 - C. Smooth Dowel Bars (Includes Bars in Dowel Bar Assemblies) 79
 - D. Support Baskets for Dowel Bars & Tie Bars..... 79
 - E. Reinforcing Bars, Deformed Dowel Bars, and Deformed Tie Bars 79
 - F. Wire Ties and Spacers 80
 - G. Reinforcing Wire Mesh (Miscellaneous)..... 80
 - H. Structural (Includes Steel Bridge Girders, Trusses, Arches, Main Supporting Members, Steel Bridge Rail, Steel Diaphragms, Sign Bridges, Splice Plates, and Bearings) 81
 - I. Miscellaneous Steel (Includes all Steel not addressed in 11.17 H) 81
 - J. Guardrail and Steel Guardrail Posts..... 81
 - K. W Beam Guardrail Flared End Terminal, and W Beam Guardrail Tangent End Terminal 82
 - L. High Tension Cable Guardrail 82
 - M. Insert Assemblies for Guardrail 82
 - N. Wedge Anchor 82
 - O. Rebar Splice 83
 - P. Concrete Insert 83

- 11.18 Timber 83
 - A. Structural 83
 - B. Guardrail Posts 83
 - C. Plank, etc. 84

- 11.19 Gabions 85
 - A. Material 85

- 11.20 Drainage Fabric 85
 - A. Material 85

- 11.21 MSE/Geotextile Fabric 86
 - A. Material 86

- 11.22 Erosion Control Items 86
 - A. Material 86

- 11.23 Controlled Density Fill/Flowable Fill
 - A. Material86
- 11.24 Polyethylene Sheeting
 - A. Material87
- 11.25 Polymer Modified Asphalt Growth Joint and Asphalt Bridge Joint
 - A. Joint System87
 - B. Aggregate87
 - C. Binder87
- 11.26 Mailbox Assemblies
 - A. Material88
- 12. Pavement Restoration:89**
 - 12.1 PCC Pavement Repair
 - A. Silicone89
 - B. Backer Rod89
 - C. Hot Poured Elastic Type90
 - D. Backer Rod (Hot Pour)90
 - 12.2 Joint and Spall Repair
 - A. Concrete from Ready-Mix Plants90
 - B. Commercial Pre-Packaged Mix91
 - C. Fly Ash91
 - D. Silicone91
 - E. Backer Rod91
 - F. Hot Poured Elastic Type92
 - G. Backer Rod (Hot Pour)92
 - 12.3 Pavement Jacking and Undersealing
 - A. Portland Cement92
 - B. Fly Ash92
 - C. Water93
 - D. Strength Tests93
 - E. Flow Test93
 - F. Jacking Foam93
- 13. Bridge Deck Restoration:94**
 - 13.1 Density Tests, Low Slump Concrete
 - A. Density, In-Place94
 - B. Density, Standard94
 - 13.2 Bridge Deck Polymer Chip Seal
 - A. Polymer94
 - B. Concrete Patching Material95
 - C. Aggregate95
 - 13.3 Measurement of Texture
 - A. Tined Surface95
 - 13.4 Measurement of Deck Roughness
 - A. Surface95