



**Republic of Moldova  
Ministry of Transport and Road Infrastructure  
State Road Administration**

**and**

**European Bank for Reconstruction and Development**

**ROAD SECTOR PROGRAM**

**Rehabilitation of R14 Balti-Sarateni Road**

**Lot 1: km 26+600 to km 38+300**

**Lot 2: km 43+000 to km 61+000 and  
km 64+370-km 66+657**

**TENDER DOCUMENTS:**

**PART 2 – REQUIREMENTS**

**TECHNICAL SPECIFICATIONS**

**Tendering No. RSP/2013/OT/W6**

**Invitation for Tenders No. RSP/2013/OT/W6/01-2**

**Chisinau, 2014**

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**TABLE OF CONTENTS**

<b>PREAMBLE</b>	<b>- 12 -</b>
<b>TECHNICAL SPECIFICATIONS</b>	<b>- 13 -</b>
<b>0. GENERAL REQUIREMENTS</b>	<b>- 13 -</b>
<b>CHAPTER 001. ACCEPTANCE OF WORKS</b>	<b>- 13 -</b>
001.00. CONFORMITY WITH CONTRACT AND PROJECT REQUIREMENTS	- 13 -
001.01. TECHNICAL INSPECTION	- 14 -
001.02. CERTIFICATION OF COMPLIANCE	- 14 -
001.03. MEASURED OR TESTED CONFORMANCE	- 15 -
<b>CHAPTER 002. MEASUREMENT AND PAYMENT</b>	<b>- 15 -</b>
002.01. MEASUREMENT METHODS	- 15 -
002.02. MEASUREMENT TERMS AND DEFINITIONS	- 15 -
002.03. WEIGHING PROCEDURES AND DEVICES	- 17 -
002.04. ACCEPTANCE PROCEDURES	- 18 -
002.05. SCOPE OF PAYMENT	- 19 -
<b>CHAPTER 003. MOBILISATION</b>	<b>- 19 -</b>
003.01. CONTRACTOR'S SITE FACILITIES	- 19 -
003.02. PROVISION OF SERVICES	- 20 -
003.03. TEMPORARY WORKS	- 20 -
<b>CHAPTER 004. ENGINEER'S FACILITIES</b>	<b>- 21 -</b>
004.01. PROJECT OFFICE	- 21 -
004.02. CONTRACT OFFICE	- 21 -
004.03. LABORATORY OFFICE	- 21 -
004.04. LAYOUT OF ENGINEER'S CONTRACT AND LABORATORY OFFICES	- 21 -
004.05. GENERAL REQUIREMENTS FOR ENGINEER'S OFFICES	- 22 -
004.06. TEMPORARY OFFICES	- 23 -
004.07. FURNITURE FOR THE ENGINEER'S OFFICES	- 23 -
004.08. VEHICLES FOR THE ENGINEER	- 23 -
004.09. COMMUNICATION FACILITIES FOR THE ENGINEER	- 23 -
004.10. MISCELLANEOUS SERVICES FOR THE ENGINEER	- 24 -
004.11. HOUSING FOR ENGINEER	- 24 -
<b>CHAPTER 005. LABORATORY</b>	<b>- 25 -</b>
<b>CHAPTER 006. MISCELLANEOUS REQUIREMENTS</b>	<b>- 27 -</b>
006.01. QUALITY ASSURANCE MANAGEMENT SYSTEM	- 27 -
006.02. SURVEY BEACONS AND BENCHMARKS; SETTING OUT	- 27 -
006.03. PROTECTION AND DIVERSION OF SERVICES	- 28 -
006.04. SEQUENCE OF KEY CONTRACT ACTIVITIES	- 29 -
006.05. RECORD DRAWINGS	- 30 -
<b>CHAPTER 007. TRAFFIC MANAGEMENT</b>	<b>- 30 -</b>
<b>CHAPTER 008. INSURANCES AND PERFORMANCE GUARANTEE</b>	<b>- 32 -</b>
<b>CHAPTER 009. CONTROL OF MATERIAL</b>	<b>- 33 -</b>
009.01. SOURCE OF SUPPLY AND QUALITY REQUIREMENTS	- 33 -
009.02. LOCAL MATERIAL SOURCES	- 33 -
009.03. STORING AND HANDLING MATERIAL	- 34 -
009.04. USE OF MATERIAL FOUND IN THE WORK	- 34 -
<b>CHAPTER 010. CEMENT</b>	<b>- 35 -</b>
010.01. PORTLAND AND MASONRY CEMENT	- 35 -
010.02. CEMENT FOR MORTAR	- 35 -

010.03. STORAGE	- 35 -
<b>CHAPTER 011. BITUMEN</b>	<b>- 35 -</b>
011.01. BITUMEN	- 35 -
011.02. BITUMINOUS EMULSION	- 36 -
011.03. WORKING TEMPERATURE	- 36 -
<b>CHAPTER 012. AGGREGATE, FILLER</b>	<b>- 36 -</b>
012.01. AGGREGATES AND SAND FOR CEMENT MORTAR AND PORTLAND CEMENT CONCRETE	- 36 -
012.02. CRUSHED STONE FOR ROAD BASE, BINDER COURSE AND WEARING COURSE	- 36 -
012.03. AGGREGATES FOR BITUMINOUS MIXTURES	- 37 -
012.04. SAND	- 37 -
012.05. FILLER	- 37 -
012.06. ADDITIVES FOR CEMENT MORTAR AND CONCRETE	- 37 -
<b>CHAPTER 013. REINFORCEMENT STEEL</b>	<b>- 37 -</b>
013.01. REINFORCEMENT STEEL	- 37 -
<b>CHAPTER 014. OTHER MATERIALS</b>	<b>- 38 -</b>
014.01. WATER	- 38 -
014.02. PAINTS	- 38 -
014.03. GEOTEXTILES	- 38 -
<b>CHAPTER 015. OCCUPATIONAL HEALTH AND SAFETY</b>	<b>- 40 -</b>
<b>CHAPTER 016. COMPLIANCE WITH ENVIRONMENTAL MANAGEMENT PLAN REQUIREMENTS</b>	<b>- 41 -</b>
016.01. REVEGETATION	- 42 -
016.02. UNNECESSARY COMPACTION OF SOIL	- 42 -
016.03. CONTAMINATION OF WATERCOURSES	- 42 -
016.04. WASTE OILS, FUEL AND BITUMINOUS MATERIALS	- 42 -
016.05. DUST	- 42 -
016.06. COVERING LOADS	- 43 -
016.07. EMISSIONS	- 43 -
016.08. NOISE LEVELS	- 43 -
016.09. NOISE BARRIERS	- 43 -
016.10. SITING OF CAMPS, ETC, DISPOSAL OF CAMP WASTE	- 43 -
016.11. OPENING AND OPERATING QUARRIES AND BORROW PITS	- 43 -
016.12. UNDESIRABLE HABITATS	- 44 -
016.13. HAZARDOUS MATERIALS	- 44 -
016.14. ACCESS ROUTES	- 44 -
016.15. CUTTING TREES	- 44 -
016.16. HUNTING, ETC.	- 44 -
016.17. ACCESS TO PROPERTIES	- 44 -
016.18. PUBLIC MEETINGS	- 44 -
016.19. ENVIRONMENTAL HEALTH AND SAFETY OFFICER	- 45 -

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## **APPENDIX TO GENERAL REQUIREMENTS SPECIFICATIONS - 46 -**

1.	<b>LIST OF STANDARDS INCORPORATED BY REFERENCE</b>	<b>- 46 -</b>
2.	<b>ENGINEER'S OFFICES</b>	<b>- 57 -</b>
3.	<b>FURNITURE AND EQUIPMENT FOR ENGINEER'S OFFICES</b>	<b>- 58 -</b>

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## **1. PREPARATORY WORKS - 59 -**

<b>CHAPTER 101. SITE PREPARATION</b>	<b>- 59 -</b>
101.01. INTRODUCTION	- 59 -
101.02. GENERAL	- 59 -
101.03. WORKS DESCRIPTION	- 59 -
101.04. WORKS ACCEPTANCE	- 60 -
<b>CHAPTER 102. SITE CLEARANCE</b>	<b>- 61 -</b>

102.01.	INTRODUCTION	- 61 -
102.02.	GENERALITIES	- 61 -
102.03.	WORKS ACCEPTANCE	- 61 -
<b>CHAPTER 103.</b>	<b>DEMOLITION</b>	<b>- 62 -</b>
103.01.	INTRODUCTION	- 62 -
103.02.	BACKFILL MATERIALS	- 62 -
103.03.	THE USE OF MATERIALS	- 62 -
103.04.	REMOVING MATERIAL	- 62 -
103.05.	DISPOSAL OF MATERIALS	- 63 -
103.06.	WORKS ACCEPTANCE	- 63 -
<b>CHAPTER 104.</b>	<b>NOT USED</b>	<b>- 64 -</b>
<b>CHAPTER 105.</b>	<b>TEMPORARY ROADS AND SIGNING</b>	<b>- 64 -</b>
105.01.	INTRODUCTION	- 64 -
105.02.	MATERIALS	- 64 -
105.03.	GENERALITIES	- 64 -
105.04.	BARRIERS	- 65 -
105.05.	CONES	- 65 -
105.06.	TEMPORARY SIGNS	- 65 -
105.07.	FLAGMEN AND TRAFFIC LIGHTS	- 65 -
105.08.	PROVISION OF DIVERSION ROADS	- 65 -
105.09.	CONSTRUCTION OF DIVERSION ROADS	- 66 -
105.10.	ILLUMINATION OF SIGNS	- 66 -
105.11.	BARRIERS, CONES, TEMPORARY SIGNS	- 67 -
105.12.	OPERATION OF TEMPORARY INSTALLATIONS	- 67 -
105.13.	ACCEPTANCE	- 67 -

## **2. EARTHWORKS** **- 69 -**

<b>CHAPTER 201.</b>	<b>THE EXECUTION OF THE EARTHWORKS</b>	<b>- 69 -</b>
201.01.	INTRODUCTION	- 69 -
201.02.	EARTHWORKS	- 69 -
201.03.	MATERIAL	- 69 -
201.04.	PREPARATORY WORK	- 70 -
201.05.	THE STOCKPILING OF TOPSOIL	- 70 -
201.06.	CONSTRUCTION WORKS	- 70 -
201.07.	THE OPERATION OF BORROW PITS	- 70 -
201.08.	THE STOCKPILING OF MATERIAL	- 70 -
201.09.	ROADBED PREPARATION	- 71 -
201.10.	CONSTRUCTION OF EMBANKMENTS	- 71 -
201.11.	COMPACTION	- 72 -
201.12.	CUTTING AND FINISHING OF SLOPES	- 72 -
201.13.	FORMATION OF SUBGRADES	- 72 -
201.14.	CONSTRUCTION AND SHAPING OF SHOULDERS	- 72 -
201.15.	EXCAVATION OF BENCHES	- 73 -
201.16.	GEOTEXTILES	- 73 -
201.16.01.	INTRODUCTION	- 73 -
201.16.02.	GENERAL	- 73 -
201.16.03.	SEPARATION AND STABILIZATION APPLICATIONS	- 73 -
201.16.04.	MEASUREMENT	- 74 -
201.17.	EMBANKMENT EROSION PROTECTION	- 74 -
201.17.01	INTRODUCTION	- 74 -
201.17.02	MATERIALS	- 74 -
201.17.03	GENERAL REQUIREMENTS	- 74 -
201.17.04	PROTECTION LAYERS CONSTRUCTION	- 74 -
201.18.	ACCEPTANCE OF WORK	- 75 -
<b>CHAPTER 202.</b>	<b>THE EXECUTION OF DITCHES</b>	<b>- 77 -</b>

202.01.	INTRODUCTION	- 77 -
202.02.	PREPARATORY WORK	- 77 -
202.03.	GENERAL	- 77 -
202.04.	WORKS ACCEPTANCE	- 77 -
<b>CHAPTER 203.</b>	<b>EXCAVATION AND BACKFILL FOR STRUCTURES</b>	<b>- 78 -</b>
203.01.	INTRODUCTION	- 78 -
203.02.	MATERIALS FOR BACKFILL	- 78 -
203.03.	PREPARATION	- 78 -
203.04.	GENERALITIES	- 78 -
203.05.	PREPARATION OF FOUNDATION WORKS	- 79 -
203.06.	BEDDING	- 79 -
203.07.	BACKFILL GENERAL	- 80 -
203.08.	COMPACTION	- 80 -
203.09.	ACCEPTANCE	- 80 -
<b>CHAPTER 204.</b>	<b>SHAPING AND PLANTING OF SLOPES AND EXCAVATED SURFACES-</b>	<b>81 -</b>
204.01.	INTRODUCTION	- 81 -
204.02.	MATERIALS	- 81 -
204.03.	SEEDING SEASON	- 81 -
204.04.	GROUND PREPARATION FOR SEEDING	- 81 -
204.05.	WATERING	- 82 -
204.06.	FERTILIZATION	- 82 -
204.07.	SEEDING AND PLANTING	- 82 -
204.08.	PREPARATION OF SEEDS	- 82 -
204.09.	PROTECTION AND MAINTENANCE OF THE PLANTS	- 82 -
204.10.	WORKS ACCEPTANCE	- 82 -
<b>CHAPTER 205.</b>	<b>PLANTING OF TREES AND SHRUBS</b>	<b>- 83 -</b>
205.01.	INTRODUCTION	- 83 -
205.02.	MATERIALS	- 83 -
205.03.	PLANTING SEASON	- 83 -
205.04.	PLANTING	- 83 -
205.05.	WATERING	- 84 -
205.06.	FERTILIZATION	- 84 -
205.07.	PROTECTION AND MAINTENANCE OF THE PLANTS	- 84 -
205.08.	WORKS ACCEPTANCE	- 84 -
<b>3.</b>	<b>PAVEMENT</b>	<b>- 85 -</b>
<b>CHAPTER 301.</b>	<b>COLD IN PLACE RECYCLING OF THE ASPHALT CONCRETE PAVEMENTS</b>	<b>- 85 -</b>
301.01.	INTRODUCTION	- 85 -
301.02.	MATERIALS	- 85 -
301.03.	CONSTRUCTION REQUIREMENTS	- 85 -
301.04.	RESTRICTIONS DUE TO WEATHER CONDITIONS	- 86 -
301.05.	MILLING OF THE PAVEMENT	- 86 -
301.06.	PREPARATION OF MIXTURE	- 86 -
301.07.	DISTRIBUTION AND COMPACTION OF THE MIXTURE	- 86 -
301.08.	CURING OF THE RECYCLED LAYER	- 87 -
301.09.	EQUIPMENT	- 87 -
301.10.	ACCEPTANCE	- 87 -
301.11.	ADJUSTMENTS FOR DENSITY	- 88 -
<b>CHAPTER 302.</b>	<b>ASPHALT PAVEMENT MILLING</b>	<b>- 88 -</b>
302.01.	INTRODUCTION	- 88 -
302.02.	CONSTRUCTION REQUIREMENTS	- 88 -
302.03.	MILLING	- 89 -
302.04.	ACCEPTANCE	- 89 -
<b>CHAPTER 303.</b>	<b>WIDENING AND RECONSTRUCTION OF THE EXISTING CARRIAGEWAY AND PROVISION OF NEW PAVEMENT</b>	<b>- 90 -</b>

303.01.	INTRODUCTION	- 90 -
303.02.	MATERIALS	- 90 -
303.03.	GENERAL INFORMATION	- 90 -
303.04.	CONSTRUCTION PROCEDURE	- 90 -
303.05.	WORK ACCEPTANCE	- 92 -
<b>CHAPTER 304.</b>	<b>PRIME AND TACK COATS FOR SUPPORTING SURFACE</b>	<b>- 92 -</b>
304.01.	INTRODUCTION	- 92 -
304.02.	MATERIALS	- 92 -
304.03.	EQUIPMENT	- 93 -
304.04.	SURFACE PREPARATION	- 93 -
304.05.	WEATHER CONDITIONS	- 93 -
304.06.	APPLICATION OF PRIME AND TACK COATS	- 93 -
304.07.	WORKS ACCEPTANCE	- 94 -
<b>CHAPTER 305.</b>	<b>ASPHALT CONCRETE FOR PAVEMENTS</b>	<b>- 95 -</b>
305.01.	INTRODUCTION	- 95 -
305.02.	MATERIALS	- 95 -
305.03.	GENERAL REQUIREMENTS	- 95 -
305.04.	MIXING EQUIPMENT	- 96 -
305.05.	ASPHALT FINISHERS	- 96 -
305.06.	THE PREPARATION OF THE SUPPORTING SURFACE	- 96 -
305.07.	WEATHER CONDITIONS	- 97 -
305.08.	ASPHALT MIX DESIGN AND TESTING	- 97 -
305.09.	BITUMEN PREPARATION	- 99 -
305.10.	PREPARATION OF THE AGGREGATES	- 99 -
305.11.	MIXING	- 99 -
305.12.	TRANSPORT	- 100 -
305.13.	SUPPLYING AND LAYING	- 100 -
305.14.	COMPACTION	- 100 -
305.15.	JOINTS, SHAPING AND EDGE CLEANING	- 101 -
305.16.	TOLERANCES ON FINISHED WORK	- 102 -
305.17.	ACCEPTANCE PROCEDURES	- 102 -
<b>CHAPTER 306.</b>	<b>REMOVING, RESTORING AND REPAIRING THE SHOULDERS</b>	<b>- 104 -</b>
306.01.	INTRODUCTION	- 104 -
306.02.	MATERIALS	- 104 -
306.03.	THE REMOVAL AND RECONSTRUCTION OF SHOULDERS	- 104 -
306.04.	SURFACING OF THE SHOULDERS WITH ASPHALT CONCRETE	- 105 -
306.05.	ACCEPTANCE OF WORKS	- 105 -
<b>CHAPTER 307.</b>	<b>VARIOUS ASPHALT WORKS</b>	<b>- 106 -</b>
307.01.	INTRODUCTION	- 106 -
307.02.	ASPHALT MIXTURE FORMULA	- 106 -
307.03.	PREPARATION OF SUPPORTING SURFACE	- 106 -
307.04.	WEATHER LIMITS	- 106 -
307.05.	TRANSPORT	- 106 -
307.06.	MIXTURE LAYING	- 106 -
307.07.	THE COMPACTION	- 106 -
307.08.	SURFACE TOLERANCE	- 107 -
307.09.	WORKS ACCEPTANCE	- 107 -
<b>CHAPTER 308.</b>	<b>NOT USED</b>	<b>- 107 -</b>
<b>CHAPTER 309.</b>	<b>NOT USED</b>	<b>- 107 -</b>
<b>CHAPTER 310:</b>	<b>MEASUREMENT OF PAVEMENT ROUGHNESS</b>	<b>- 107 -</b>
310.01.		- 107 -
310.02.		- 107 -
310.03.		- 108 -
310.04.	MEASURING IRI	- 108 -
310.04.1	INTRODUCTION	- 108 -
310.04.2	IRI MEASUREMENT PROCEDURE	- 108 -

310.04.3 ADDITIONAL REQUIREMENTS FOR COLLECTION OF ROUGHNESS DATA	- 109 -
310.05. IRI REQUIREMENTS	- 109 -
310.5.1 IRI ACCEPTANCE CRITERIA	- 109 -
310.05.2 ASPHALT CONCRETE WEARING COURSE REPAIRS	- 109 -
<b>CHAPTER 311. PAVEMENT PATCHING</b>	<b>- 110 -</b>
311.01. INTRODUCTION	- 110 -
311.02. MATERIALS	- 110 -
311.03. EQUIPMENT	- 110 -
311.04. THE CUTTING AND REMOVAL OF DEGRADED MATERIALS	- 110 -
311.05. TACK-COATING OF THE SURFACE	- 111 -
311.06. POTHOLE PATCHING	- 111 -
311.07 ACCEPTANCE	- 111 -
<b>CHAPTER 312. MAKING GOOD CRACKS AND JOINTS IN THE EXISTING PAVEMENT</b>	<b>- 112 -</b>
312.01. INTRODUCTION	- 112 -
312.02. MATERIALS	- 112 -
312.03. EQUIPMENT.	- 112 -
312.04. CLEANING AND SEALING OF MAJOR CRACKS.	- 113 -
312.05. DEFECTIVE CRACKS AND JOINTS.	- 113 -
312.06. WORKS ACCEPTANCE.	- 113 -
312.07. APPLICATION OF SAMI LAYER.	- 113 -
312.08. DEFECTIVE APPLICATION.	- 115 -
312.09. WORKS ACCEPTANCE.	- 115 -
<b>CHAPTER 313. CONCRETE PAVEMENT JOINTS</b>	<b>- 115 -</b>
313.01. INTRODUCTION	- 115 -
313.02. MATERIALS	- 116 -
313.03. EQUIPMENT	- 116 -
313.04. CLEANING OLD JOINTS	- 116 -
313.05. REPAIRS TO JOINTS	- 116 -
313.06. SEALING JOINTS	- 117 -
<b>CHAPTER 314. SIMPLE BITUMINOUS TREATMENTS</b>	<b>- 118 -</b>
314.01. INTRODUCTION	- 118 -
314.02. MATERIALS	- 118 -
314.03. EXECUTION OF THE WORKS	- 118 -
314.04. TESTING	- 119 -
314.05. WORKS ACCEPTANCE.	- 119 -

**APPENDIX TO PAVEMENT - : DETERMINATION OF INTERNATIONAL ROUGHNESS INDEX (IRI)  
TO QUANTIFY PAVEMENT ROUGHNESS IN MOLDOVA** - 120 -

1.	<b>SCOPE</b>	- 120 -
2.	<b>REFERENCED DOCUMENTS</b>	- 120 -
3.	<b>SIGNIFICANCE AND USE</b>	- 120 -
4.	<b>TERMINOLOGY</b>	- 120 -
5.	<b>QUALITY CONTROL</b>	- 121 -
6.	<b>DATA COLLECTION</b>	- 121 -
7.	<b>CALCULATIONS</b>	- 121 -
8.	<b>REPORT</b>	- 121 -

**4. BRIDGES AND OVERPASSES** - 123 -

**CHAPTER 401. REPAIRS TO THE INFRASTRUCTURE AND SUPERSTRUCTURE- 123 -**

401.01. INTRODUCTION	- 123 -
401.02. MATERIALS	- 123 -
401.03. EQUIPMENT	- 123 -
401.04. REPAIR WORKS (PLASTER), RUN OF SLOPE, BEAM JOINTS.	- 123 -

401.05. CLEANING AND FILLING OF CRACKS	- 123 -
401.06. CONSOLIDATION OF REINFORCED CONCRETE PILES.	- 123 -
401.07. WORK ACCEPTANCE	- 124 -
<b>CHAPTER 402. PILE PIERS, PILE ABUTMENTS AND RETAINING/PROTECTION WALLS- 125 -</b>	
402.01. INTRODUCTION	- 125 -
402.02. MATERIALS	- 125 -
402.03. GENERAL REQUIREMENTS.	- 125 -
402.04. EQUIPMENT..	- 125 -
402.05. PILES	- 125 -
402.06. JOINTING OF THE ABUTMENT BLOCKS AND THE RETAINING WALL.	- 126 -
402.07. THE RETAINING WALL	- 126 -
402.08. CASTING AND CURING OF CONCRETE AND MORTAR	- 126 -
402.09. WATERPROOFING	- 126 -
402.10. WORKS ACCEPTANCE	- 126 -
<b>CHAPTER 403. REPAIR OF ABUTMENTS WING WALLS</b>	<b>- 127 -</b>
403.01. INTRODUCTION	- 127 -
403.02. MATERIALS	- 127 -
403.03. GENERAL CONDITIONS.	- 127 -
403.04. EQUIPMENT.	- 127 -
403.05. EXCAVATION WORKS FOR THE EXECUTION OF THE ABUTMENT WING WALLS	- 127 -
403.06. FORMWORK	- 128 -
403.07. STEEL REINFORCEMENT	- 128 -
403.08. CONCRETE CASTING WORKS	- 128 -
403.09. WATERPROOFING	- 128 -
403.10. ACCEPTANCE OF WORKS	- 128 -
<b>CHAPTER 404. SUPERSTRUCTURE: SPANS 3,90, 4,80, 8,66, 11,36 M</b>	<b>- 129 -</b>
404.01. INTRODUCTION	- 129 -
404.02. MATERIALS	- 129 -
404.03. EQUIPMENT	- 129 -
404.04. MOUNTING THE DECK BEAMS	- 130 -
404.05. CONCRETE CASTING AND CURING OF JOINTS	- 130 -
404.06. WORKS ACCEPTANCE	- 130 -
<b>CHAPTER 405. CONSTRUCTION OF APPROACH SLABS</b>	<b>- 130 -</b>
405.01. INTRODUCTION	- 130 -
405.02. MATERIALS	- 131 -
405.03. GENERAL	- 131 -
405.04. EQUIPMENT	- 131 -
405.05. CRUSHED STONE BED FOR THE BEARING BEAM	- 131 -
405.06. INSTALLATION OF BEARING BEAMS AND APPROACH SLABS	- 131 -
405.07. CASTING AND CURING OF CONCRETE AT THE APPROACH TO BRIDGES	- 131 -
405.08. WATERPROOFING	- 132 -
405.09. ACCEPTANCE OF WORK	- 132 -
<b>CHAPTER 406. REPAIRS TO ABUTMENT EARTHWORKS (CONES)</b>	<b>- 132 -</b>
406.01. DESCRIPTION	- 132 -
406.02. MATERIALS	- 132 -
406.03. GENERAL REQUIREMENTS	- 133 -
<b>CHAPTER 407. EXPANSION JOINTS</b>	<b>- 134 -</b>
407.01. INTRODUCTION	- 134 -
407.02. MATERIALS	- 134 -
407.03. GENERAL REQUIREMENTS	- 134 -
407.04. WORKS ACCEPTANCE.	- 134 -
<b>CHAPTER 408. WATERPROOFING</b>	<b>- 135 -</b>
408.01. INTRODUCTION	- 135 -
408.02. MATERIALS	- 135 -
408.03. GENERAL REQUIREMENTS.	- 136 -
408.04. ACCEPTANCE OF WORKS	- 136 -
<b>CHAPTER 409. SAFETY BARRIERS</b>	<b>- 137 -</b>



409.01. INTRODUCTION	- 137 -
409.02. MATERIALS	- 137 -
409.03. WORKING REQUIREMENTS	- 137 -
409.04. ACCEPTANCE OF WORKS	- 137 -
<b>CHAPTER 410. SURFACE WATER DISPOSAL</b>	<b>- 138 -</b>
410.01. INTRODUCTION	- 138 -
410.02. MATERIALS	- 138 -
410.03. GENERAL REQUIREMENTS.	- 139 -
410.04. PRECAST REINFORCED CONCRETE UNITS	- 139 -
410.05. CONCRETE WORKS	- 139 -
410.06. ACCEPTANCE OF WORKS	- 139 -
<b>CHAPTER 411. ACCESS STAIRS ON SLOPES</b>	<b>- 140 -</b>
411.01. INTRODUCTION	- 140 -
411.02. MATERIALS	- 140 -
411.03. GENERAL CONDITIONS	- 140 -
411.04. WORK ACCEPTANCE	- 140 -
<b>CHAPTER 412. PROTECTION OF SURFACES</b>	<b>- 141 -</b>
412.01. INTRODUCTION	- 141 -
412.02. MATERIALS	- 141 -
412.03. GENERAL REQUIREMENTS	- 141 -
412.04. PROTECTION OF THE CONICAL SURFACES AT BRIDGE ABUTMENTS.	- 142 -
412.05. PROTECTION TO EMBANKMENT SLOPES AT BRIDGE APPROACHES.	- 142 -
412.06. PROTECTION TO RIVER BEDS BENEATH BRIDGES	- 142 -
412.07. ACCEPTANCE OF WORKS	- 142 -
<b>CHAPTER 413. ASPHALT CONCRETE TO PAVEMENT AND SHOULDERS</b>	<b>- 142 -</b>
413.01. INTRODUCTION	- 143 -
413.02. MATERIALS	- 143 -
413.03. CARRIAGEWAYS AND WALKWAYS	- 143 -
413.04. SHOULDERS	- 143 -
413.05. WORK ACCEPTANCE	- 143 -
<b>CHAPTER 414. PEDESTRIAN SAFETY PARAPETS</b>	<b>- 144 -</b>
414.01. INTRODUCTION	- 144 -
414.02. MATERIALS	- 144 -
414.03. GENERAL REQUIREMENTS.	- 144 -
414.04. WORK ACCEPTANCE	- 145 -
<b>CHAPTER 415. BRIDGE BEARINGS</b>	<b>- 145 -</b>
415.01. INTRODUCTION	- 145 -
415.02. MATERIALS	- 145 -
415.03. EQUIPMENT	- 146 -
415.04. MOUNTING BRIDGE DECKS FOR MOUNTING OF RUBBER BEARINGS	- 146 -
415.05. BEARING PAINTING-NOT USED	- 146 -
415.06. TRAFFICKING ON THE BRIDGE DECK	- 146 -
415.07. WORKS ACCEPTANCE	- 146 -
<b>CHAPTER 416. NOT USED</b>	<b>- 146 -</b>
<b>CHAPTER 417. SLABS TO BRIDGE DECKS, BRIDGE WALKWAYS, PARAPETS.</b>	<b>- 146 -</b>
417.01. INTRODUCTION	- 146 -
417.02. MATERIALS	- 147 -
417.03. GENERAL CONDITIONS.	- 147 -
417.04. EQUIPMENT..	- 147 -
417.05. FORMWORK	- 147 -
417.06. REINFORCEMENT	- 147 -
417.07. CONCRETE WORKS	- 148 -
417.08. WATERPROOFING	- 148 -
417.09. WORKS ACCEPTANCE	- 148 -
<b>CHAPTER 418. WORKS OF DISMANTLING AND DEMOLITION</b>	<b>- 149 -</b>
418.01. INTRODUCTION	- 149 -
418.02. EQUIPMENT.	- 149 -

418.03. DISMANTLING AND DEMOLITION OF ELEMENTS	- 149 -
418.04. WORKS ACCEPTANCE	- 149 -
<b>5. DRAINAGE STRUCTURES</b>	<b>- 151 -</b>
<b>CHAPTER 501. CULVERTS AND DRAINAGE FACILITIES</b>	<b>- 151 -</b>
501.01. INTRODUCTION	- 151 -
501.02. GENERAL	- 151 -
501.03. JOINT SEALING	- 151 -
501.04. PIPES	- 151 -
501.05. GENERALITIES	- 151 -
501.06. EXTENSION OF THE EXISTING CULVERTS	- 152 -
501.07. REPLACEMENT OF EXISTING CULVERTS	- 152 -
501.08. CONSTRUCTION OF NEW CULVERTS	- 152 -
501.09. CULVERTS TO PROPERTY ENTRANCES AND SIDE ROADS	- 152 -
501.10. ADDITIONAL PROTECTION	- 152 -
501.11. WORKS ACCEPTANCE	- 153 -
<b>CHAPTER 502. CLEANING, RECONDITIONING AND REPAIRING EXISTING INLETS, OUTLETS, DRAINS, SPILLWAYS AND CHUTES</b>	<b>- 154 - - 154 - - 154 -</b>
502.01. INTRODUCTION	- 154 -
502.02. MATERIALS	- 154 -
502.03. CLEANING CULVERTS IN PLACE	- 155 -
502.04. REPAIRING OF THE EXTREMITIES OF THE CULVERTS	- 155 -
502.05. REPAIR OF DRAINS, SPILLWAYS AND CHUTES	- 155 -
502.06. CLEANING LINED SIDE DRAINS	- 155 -
502.07. WORKS ACCEPTANCE	- 155 -
<b>CHAPTER 503. PAVED WATERWAYS</b>	<b>- 156 -</b>
503.01. INTRODUCTION	- 156 -
503.02. MATERIALS	- 156 -
503.03. GENERALITIES	- 157 -
503.04. CONCRETE CHUTES AND GULLIES	- 157 -
503.05. LINED SIDE DRAINS AND WATERWAY	- 157 -
503.06. WORKS ACCEPTANCE	- 157 -
<b>CHAPTER 504. MINOR CONCRETE STRUCTURES</b>	<b>- 159 -</b>
504.01. INTRODUCTION	- 159 -
504.02. MATERIALS	- 159 -
504.03. CONCRETE COMPOSITION	- 160 -
504.04. GENERALITIES	- 160 -
504.05. CASTING CONCRETE	- 161 -
504.06. CURING CONCRETE	- 161 -
504.07. WORKS ACCEPTANCE	- 161 -
<b>CHAPTER 505. NOT USED</b>	<b>- 162 -</b>
<b>CHAPTER 506. NOT USED</b>	<b>- 162 -</b>
<b>CHAPTER 507. NOT USED</b>	<b>- 162 -</b>
<b>CHAPTER 508. KERBS</b>	<b>- 162 -</b>
508.01. INTRODUCTION	- 162 -
508.02. MATERIALS	- 162 -
508.03. GENERALITIES	- 163 -
508.04. PLACING KERBS	- 163 -
508.05. CURING CONCRETE	- 163 -
508.06. WORKS ACCEPTANCE	- 163 -
<b>CHAPTER 509. DRAINS, MANHOLES, EXIT GULLY</b>	<b>- 164 -</b>
509.01. INTRODUCTION	- 164 -
509.02. MATERIALS	- 164 -
509.03. WORKING CONDITIONS	- 164 -

509.04. WORKS ACCEPTANCE	- 165 -
--------------------------	---------

## **6. INCIDENTAL CONSTRUCTION** - 166 -

<b>CHAPTER 601. GUARDRAIL</b>	<b>- 166 -</b>
601.01. INTRODUCTION	- 166 -
601.02. MATERIALS	- 166 -
601.03. WORKING CONDITIONS	- 166 -
601.04. GUARDRAIL SUPPLEMENTARY REQUIREMENTS	- 166 -
601.05. POSTS.	- 167 -
601.06. RAIL ELEMENTS.	- 167 -
601.07. REMOVING AND RE-INSTALLING GUARDRAIL.	- 167 -
601.08. GUARD RAIL FINISHED ALIGNMENT	- 168 -
601.09. WORKS ACCEPTANCE	- 168 -
<b>CHAPTER 602. NOT USED</b>	<b>- 169 -</b>
<b>CHAPTER 603. NOT USED</b>	<b>- 169 -</b>
<b>CHAPTER 604. NOT USED</b>	<b>- 169 -</b>

## **7. ROAD MARKING AND SIGNING** - 169 -

<b>CHAPTER 701. PERMANENT TRAFFIC CONTROL</b>	<b>- 169 -</b>
701.01. INTRODUCTION	- 169 -
701.02. MATERIALS	- 169 -
701.03. GENERALITIES	- 169 -
701.04. SIGN SUPPORTS	- 170 -
701.05. SIGN PANELS	- 170 -
701.06. MARKER POSTS AND KILOMETRE POSTS	- 170 -
701.07. WORKS ACCEPTANCE	- 170 -
<b>CHAPTER 702. PERMANENT ROAD MARKINGS</b>	<b>- 171 -</b>
702.01. INTRODUCTION	- 171 -
702.02. MATERIALS	- 171 -

## **FINE OR COARSE GLASS BEADS MAY BE USED AS SUCH, BUT ALSO IN A MIXTURE WITH BEADS FOR SKID-RESISTANCE.** - 172 -

702.03. APPLICATION OF ROAD MARKINGS	- 173 -
702.04. CONSTRUCTION REQUIREMENT	- 175 -
702.05. PROTECTION	- 175 -
702.06. TOLERANCES	- 176 -
702.07. FAULTY WORKMANSHIP OR MATERIALS	- 176 -
702.08. WORKS ACCEPTANCE	- 176 -
<b>CHAPTER 703. SIDE WALKS</b>	<b>- 177 -</b>
703.01. INTRODUCTION	- 177 -
703.02. MATERIALS	- 177 -
703.03. CONSTRUCTION OF SIDE WALK	- 177 -
703.04. REPAIR OF SIDEWALK	- 178 -
703.05. WORKS ACCEPTANCE	- 178 -

## **8. ENGINEERING SERVICES** - 178 -

<b>CHAPTER 801. NOT USED</b>	<b>- 178 -</b>
<b>CHAPTER 802. NOT USED</b>	<b>- 178 -</b>
<b>CHAPTER 803. NOT USED</b>	<b>- 178 -</b>
<b>CHAPTER 804. NOT USED</b>	<b>- 178 -</b>

**9. LANDSLIDE REMEDIAL WORKS****179****CHAPTER 901. EARTHWORK****179**

901.01. INTRODUCTION	179
901.02. MATERIALS	179
901.03. EXCAVATION	179
901.04. EXCAVATION IN BORROW PITS	179
901.05. CONSTRUCTION OF EMBANKMENT ON A SLOPE MORE THAN 1:3	179
901.06. EMBANKMENT CONSTRUCTION	179
901.07. GEOTEXTILES	180
901.08. SUBSURFACE DRAINAGE	180
901.09. FINISHING OF SLOPES	180
901.010. SUBGRADE	180

**CHAPTER 902. GEOTEXTILE FABRICS****181**

902.01. INTRODUCTION	181
902.02. MATERIALS	181
902.03. HANDLING AND INSTALLATION	184
902.04. ACCEPTANCE OF WORKS	185

**CHAPTER 903. NOT USED****186****CHAPTER 904. BORED PILES****186**

904.01. INTRODUCTION	186
904.02. MATERIALS	186
904.03. PILING	186
904.04.1. CAPPING BEAM	187
904.04.2. ACCEPTANCE OF WORKS	187

**CHAPTER 905. FILTER DRAIN, MANHOLES, EXIT GULLY****188**

905.01. THE WORKS INCLUDE:	188
905.02. MATERIALS SHALL BE IN ACCORDANCE WITH:	188
905.03. WORKING CONDITIONS	189
905.04. ACCEPTANCE OF WORKS	190

**CHAPTER 906. NOT USED****191**

## **PREAMBLE**

The Works specified under this Contract shall include all general and ancillary works and work of any nature that is deemed necessary for the due and satisfactory construction, completion and maintenance of the Works to the full intent and meaning of the Drawings and Specifications, whilst complying with all Conditions of Contract whether specifically mentioned or not in the clauses of the Specifications. The best general practice is to prevail that materials and workmanship will be of first quality.

The Contract may not fully describe every detail or contains specific allowances for all probable occurrences, exceptions and contingencies. The Engineer has the authority to administer the contract, to rule on discrepancies arising, to fulfil intentions, and to allow for construction needs to ensure the performance and completion of the work.

The Contractor shall construct and complete the project in every detail as described in the Drawings, the Specifications and the Bill of Quantities.

The Contractor shall consider the public interests as well as obligations and rights of all other parties involved. The Contractor has to take full responsibility for the performance of the work and agrees to furnish with labour, materials, equipment, tools, supplies, transportation, and other incidentals necessary or convenient for a successful completion of the project.

# TECHNICAL SPECIFICATIONS

## 0. GENERAL REQUIREMENTS

### ***CHAPTER 001. ACCEPTANCE OF WORKS***

#### **001.00. Conformity with Contract and Project Requirements**

Wherever reference is made in the Contract to specific standards and codes to be met by the materials, Plant, and other supplies to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. In some of the works, for a better understanding of the Technical Specifications requirements, there are included both local standards and EU, US standards. If any part/parts has/have different interpretation of the standards's applicability, the local standards will prevail. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards which ensure a substantially equal or higher performance than the standards and codes specified will be accepted subject to the Engineer's prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Engineer at least 28 days prior to the date when the Contractor desires the Engineer's approval. In the event the Engineer determines that such proposed deviations do not ensure substantially equal performance or that the deviations run counter to the established legal requirements of the Employer's country, the Contractor shall comply with the standards specified in the documents.

The works shall be executed entirely in accordance with the requirements of the Contract, including the requirements of this Specification. All works shall be executed in accordance with the required lines, grades, cross - sections, dimensions, processes and material requirements shown on the plans or specified in the contract or design documents.

The works shall be executed in compliance with the provisions of Law on quality in construction No.271 dated February 2, 1996. The State Construction Inspectorate is empowered to initiate controls on quality of works, laboratory tests, compliance with design, construction standards and norms, and abovementioned Law.

Plan dimensions and contract specification values are to be complied with subject only to the variances and tolerances specifically allowed for in this Specification. Works and materials shall be uniform in character and meet the specified requirements.

The Engineer may inspect, sample or test all work at any time before final acceptance of the project. When the Engineer tests work, copies of test reports are furnished to the Contractor. Engineer's tests may or may not be performed at the work site.

Acceptable work conforming to the contract will be paid for at the contract unit bid price. Methods of determining conformity and accepting work are described in Subsection 001.02 to 001.04 inclusive. The primary method of acceptance is specified in each Section of work. Where appropriate, acceptance of work shall be in accordance with Sub-Clause 002.03 and Sub-Clause 002.04 of Chapter 002.

Work shall be rejected at any time it is found not to comply with the specifications and drawings. The initial acceptance of work does not imply that the work necessarily complies with the Contract requirements. Work may be inspected and rechecked for conformity at any time and work found not to conform shall be rectified or removed and replaced by the Contractor at no cost to the Employer.

Work that does not conform to the project and contract requirements or to prevailing industry standards where no specific contract requirements are noted, shall be removed and replaced at no cost to the Employer.

#### **001.01. Technical Inspection**

Acceptance is based on technical inspection of executed works to confirm compliance with the contract documents and prevailing relevant technical standards. Payment for work during the course of the project will be made as the work progresses provided it is in compliance with the drawings and specifications.

The Contractor shall submit checking requests to the Engineer, giving a minimum period of notice of at least 24 hours before the scheduled commencement of works in order to allow the Engineer time to carry out a full and detailed inspection of the works. The checking request signed by the Engineer shall be the basis for the payment certificate.

#### **001.02. Certification of Compliance**

Where the Contractor provides materials, fabricated products and structures (hereinafter "materials") from a manufacturer; that manufacturer must have an effective testing and inspection system. The Contractor shall require the manufacturer to furnish documentation from the testing and inspection system comprising a Certificate of Compliance that certifies the materials comply with all contract requirements.

The testing and inspection system shall conform to a quality assurance management system as described in Sub-Clause 006.01.

The Contractor shall require the manufacturer to furnish a "product certificate" for material commercially produced to a standard specification. The manufacturer shall clearly mark the material or package with unique product identification.

Require the manufacturer to furnish a "product certificate" for material that:

- Is custom made for the project, or
- Is produced or shipped in bulk and therefore not readily identifiable as to manufacturer and product, or
- Has a specific contract requirement

A unique "product certificate" shall accompany each shipment of material and shall identify the date and place of manufacture as well as the lot number or other means of cross referencing to the inspection and testing system. Furnish specific test results on material from the same lot upon request.

Material or assemblies accepted on the basis of a Certificate of Compliance may be sampled and tested at any time. If found not to be in conformity with the contract requirements, all the materials or assemblies will be rejected whether in place or not until the items in place have been individually tested and have been approved by the Engineer. Material or assemblies supplied without a Certificate of Compliance will be rejected without further argument or discussion and shall be removed from the site forthwith.

### **001.03. Measured or Tested Conformance**

The Contractor shall provide all necessary control of the production, processing and performance of the work to ensure that all of the work complies with all the contract requirements.

Results from inspection and/or testing used to support acceptance of the work incorporated into the project shall have values within the specified tolerances or specification limits. When no tolerance values are identified in the contract, the work will be accepted based on customary manufacturing and construction tolerances.

## ***CHAPTER 002. MEASUREMENT AND PAYMENT***

### **002.01. Measurement Methods**

Accepted work will be measured according to the metric, International System of Units (SI) system. Unless otherwise specified, measurement will be made when the work is in place, complete, and accepted. Measurements will be made for the actual quantity of work performed. Structures will be measured to the net lines shown on the plans or to approved lines that have been adjusted to fit field conditions.

The “measurement” subsections detailing specifics and exceptions for measuring work are described under each Section.

### **002.02. Measurement Terms and Definitions**

Unless otherwise specified, the meanings of the following terms are as follows:

#### **(a) Provisional sum**

Perform the work only when authorized by written order from the Engineer. The work will be measured and paid for at agreed unit prices, or lump sum price, as established in the order authorizing the work. When the unit bid price is designated “provisional sum”, the quantity is designated as “All”.

#### **(b) Contract quantity**

The contract quantity is the quantity shown in the Bill of Quantities; these quantities are estimated and provisional. The contract quantities will be adjusted for authorized changes that affect the quantity or for errors made in computing this quantity, and in accordance with the quantities as ordered and carried out, and as measured by the Contractor and verified by the Engineer. If there is evidence that a quantity specified as a contract quantity is incorrect, the Contractor shall submit calculations, drawings or other evidence indicating why the quantity is in error and request, in writing, that the quantity be adjusted.

#### **(c) Cubic meter of Earthworks**

Unless the Engineer directs that other means are to be used the volume will be measured by the average end area method as follows:

**(1)** Take cross sections of the original ground and use with design or staked templates or take other comparable measurements to determine the end areas. Work outside of the established lines or slopes will not be measured.

**(2)** If any portion of the work is acceptable but is not completed to the established lines and slopes, take remeasure cross sections or comparable measurements of that portion of the work. Use these measurements to calculate new end areas.



**(3)** Compute the quantity using the average end areas multiplied by the horizontal distance along a centreline or reference line between the end areas. Deduct any quantity determined outside the designed or stakes slope limits. Where it is impractical to measure by the average end area method, other methods involving three dimensional measurements may be used.

**(d) Cubic meter in the hauling vehicle**

The cubic meter volume will be measured in the hauling vehicle using three dimensional measurements at the point of delivery. Use vehicles bearing a legible identification mark with the body shaped so the actual contents may be readily and accurately determined. Before use, mutually agree in writing on the volume of material to be hauled by each vehicle. Vehicles carrying less than the agreed volume may be rejected or accepted at the reduced volume.

Level selected loads. If levelling reveals the vehicle has been hauling less than the approved volume, all material received since the last levelled load will be reduced by the same ratio as the current levelled load volume is to the agreed volume.

Material measured in the hauling vehicle may be weighed and converted to cubic meters for payment purposes if the conversion factors are mutually agreed to in writing.

There will be no separate pay item for the haulage of materials, it shall be deemed to be included in the relevant pay items.

**(e) Number**

One entire unit. The quantity is the actual number of units completed and accepted.

**(f) Liter**

The quantity may be measured by any of the following methods:

**(1)** Measured volume container.

**(2)** Metered volume. Use approved metering system.

**(3)** Commercially packaged volumes.

When asphalt material is measured by the litre, the volume will be measured at 15 ° C or will be corrected to a volume at 15 ° C using recognized standard correction factors.

**(g) Hour**

Measurement will be for the actual number of hours ordered and performed by the Contractor.

**(h) Linear meter**

Measurement will be from end to end parallel to the base or foundation upon which the item is placed.

**(i) Lump sum**

No direct measurement will be made. The bid amount is complete payment for all work as described in the contract and necessary to complete all the work for that item. The quantity is designated as "All".

The estimate quantities of lump sum work shown in the contract are approximate.

**(j) Kilometer**

1000 linear meters. Measurement will be horizontal along the centreline of each roadway, approach road, or ramp.

**(k) Kilogram**

The weight measured according to Sub-Clause 002.03. If sacked or packaged material is furnished, the net weight as packed by the manufacturer may be used.

**(l) Square meter**

Longitudinal and transverse measurements for area computation will be made horizontally. Where a pavement structure course is measured by square meter, the width of measurement will be the top design width of the course plus allowable curve widening, not including side slopes. The length will be the distance measured horizontally along the centreline of each roadway, approach road, or ramp.

**(m) Station**

100 linear meters. Measurement will be horizontal along the centreline of each roadway, approach road, or ramp

**(n) Ton**

1000 kilograms. Measurement will be according to Sub-Clause 002.03.

No adjustment in contract unit price will be made for variations in quantity due to differences in the specific gravity or moisture content.

Net certified scale weights, or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement subject to correction when asphalt material is lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt material is shipped by truck or transport, net certified weights, subject to correction for loss or foaming, may be used for computing quantities.

When asphalt cement for concrete pavement is stored in tanks devoted exclusively to the project, quantities will be based on invoices. When asphalt cement for asphalt concrete pavement is not stored in tanks devoted exclusively to the project, quantities will be based on the tank measurements, converted to volumes.

### **002.03. Weighing Procedures and Devices**

Furnish, erect and maintain scales or use permanently installed and certified commercial scales for weighing material that are proportioned or measured and paid for by weight.

If bulk material is shipped by truck or rail and is not passed through a mixing plant, the supplier's invoice with net weights or volumes converted to weights may be accepted. Periodic check-weighing may be required.

Batch weights may be acceptable for determination of pay quantities when an approved automatic weighing, cycling, and monitoring system is included as part of the batching equipment.

Before use at a new site, have the scale checked, adjusted, and certified by an approved testing firm, a laboratory of the State responsible for weights and measures, or a qualified manufacturer's representative. Maintain the scale accuracy to within 0,5% of the correct weight throughout the range of use. Do not use spring balances.

Install and maintain platform scales with the platform level with rigid bulkheads at each

end. Make the platform of sufficient length to permit simultaneous weighing all axle loads of the hauling vehicle. Coupled vehicles may be weighed separately or together.

When a weighing device is determined to indicate less than true weight, no additional payment will be made for material previously weighed and recorded. When a weighing device is determined to indicate more than true weight, all material received after the last previously correct weighing accuracy test will be reduced by the percentage of error in excess of 0,5%.

Furnish competent scale operators to weigh and record the gross, tare, and net weights of all material measured by weight. Read and record weights to the nearest 50 kilograms. Increments smaller than 50 kilograms are permitted for automatic weighing systems.

Weigh the empty haulage vehicles on platform scales with full fuel tanks at least twice per shift.

Documents that support weighed pay quantities shall contain the following information, as applicable, to the type of scales and recording system used:

- (a) Project identification
- (b) Contract item number
- (c) Material source/plant identification
- (d) Date
- (e) Load number
- (f) Truck identification
- (g) Time of weighing
- (h) Applicable empty and loaded weights
- (i) Scale operator's signature

Use an approved pre-printed format for the weigh records; furnish the original record(s) and a written certification as to the accuracy of the weights at end of each shift.

#### **002.04. Acceptance Procedures**

When the method of measurement requires weighing or volume measurement in the hauling vehicle, furnish a person to direct the spreading and distribution of material and to record the location and placement of material on the project. During the placement, maintain a record of each delivery and document it in an acceptable manner. The document shall include the following information as applicable:

- (a) Project identification
- (b) Contact pay item number and description
- (c) Location where placed
- (d) Date
- (e) Load number
- (f) Truck identification
- (g) Time of arrival
- (h) Weight or volume

(i) Site supervisor's signature

Use an approved format for the delivery record(s). Furnish the original record(s) and a written certification of the delivery of the material at the end of each shift.

**002.05. Scope of payment**

Compensation provided for in the contract is full payment for performing all contract work in a complete and acceptable manner. All risk, loss damage, or expense arising out of the nature or prosecution of the work is included in the compensation provided by the contract.

If the contract requires work to be executed and there is no provision for the direct measurement of the work by the payment Section or no pay item specifically established for the work, there will be no direct payment for the work. The cost of the work is considered included under the other contract pay items.

Work measured and paid for less than one pay item will not be paid for under any other pay item.

The quantities shown in the bid schedule are approximate. Pay quantities will be limited to the quantities actually ordered, or otherwise authorized before performing the work. Payment will be made for work performed and accepted or material furnished according to the contract on the basis of the authorised quantities or for the actual quantities of work executed and accepted where such quantities are less than those authorised. No payment will be made for work performed in excess of that staked, ordered, or otherwise authorized.

**CHAPTER 003. MOBILISATION**

**003.01. Contractor's Site Facilities**

The Contractor shall find his own site or sites for setting up one or more compounds in which to locate his offices, workshops, stores, plant, etc. The sites shall include space for the Engineer's offices and the laboratory, as described below, or shall be close to the location of these facilities. The Contractor is required to have definite drawings for the necessary sites at an early stage and must show that he has guaranteed access to suitable sites and outline permission to occupy and use such sites.

The Contractor shall at all times keep the compounds in good order and shall maintain all facilities. He shall take measures to ensure that his operations do not cause pollution of watercourses or ground water. These measures shall include, but shall not be limited to, bunds round storage areas for hazardous materials and hard standings with fuel traps for vehicle washing areas and fuel stations.

On completion of the Works the Contractor shall remove his offices, workshops, stores, plant, fencing, hard-standing, etc, clear the site and carry out any other works necessary to return the site(s) to the same condition in which it was found.

The Contractor shall locate his own areas for the disposal of waste and unwanted materials, complying with local regulations and procedures for transport and disposal.

Contractor's Equipment shall be operated and maintained in accordance with the

manufacturer's instructions. Equipment shall be fitted with noise suppression and emission control devices in accordance with current technologies and which satisfy local regulations.

### **003.02. Provision of Services**

The Contractor shall make his own arrangements for and provide and distribute to all points where they are required such supplies of water, fuel, light and power as may be needed for the construction of the Works. He shall ensure that adequate supplies of water, light and power are available in offices and other buildings requiring them. He shall also ensure that sufficient supplies of drinking water are available on site for the workforce. The Contractor shall be entirely responsible for entering into any necessary agreements with the suppliers of services and paying all fees, dues, rents and other costs incurred thereby. As in the case of any other supplier, a failure on the part of a supplier of services will not relieve the Contractor of any of his duties and responsibilities under the Contract, nor in respect of such failure shall the Contractor have any claim under the Contract.

The Contractor shall, if necessary, provide generators, substations, switchgear, transformers, cabling, pumping plant, tanks, piping, filters and other things needed to maintain services to the Works.

### **003.03. Temporary Works**

The Contractor shall design, arrange and provide at his own cost all temporary works needed in order to carry out the permanent works. The temporary works shall include the provision of road diversions where considered necessary. All temporary works shall be to the satisfaction of the Engineer, but this shall not relieve the Contractor of his responsibility for their design, maintenance and adequacy. The Contractor shall obtain the approval of Ministries, service owners, local authorities and other third parties for the temporary works where required.

Temporary road diversions shall be designed and constructed to ensure that they perform satisfactorily in use and that there is no significant settlement, rutting or distortion of the running surface. They shall be surfaced and maintained to the satisfaction of the Engineer.

The Contractor may, design and construct any approved temporary diversion road and bridge scheme, provided the construction provided the construction does not extend outside the boundaries of the land arranged by the Employer (if any). If the Contractor chooses to use any outline design provided he shall make his own arrangements to locate, procure and transport on and off site the elements required. The Employer accepts no responsibility for the non-availability of elements shown in any outline design. If the Contractor elects to design and construct his own scheme then he shall arrange for all necessary approvals from local authorities, river authorities, etc. and shall obtain the approval of the Engineer for the detailed scheme including traffic management arrangements.

On completion of the Works the Contractor shall remove all temporary road diversions and other temporary works and reinstate the ground on which they have been located to its original condition or to the satisfaction of the Engineer.

### **Measurement**

No direct payment will be made for Mobilisation; in accordance with the Contract the Employer will make an Advance Payment against a suitable Guarantee which shall be used to cover immediate mobilisation costs.

The conditions governing payment and repayment of the Advance Payment are given in the Contract Data attached to the Conditions of Contract.

## **CHAPTER 004.        *ENGINEER'S FACILITIES***

### **004.01.        Project Office**

Not Used.

### **004.02.        Contract Office**

The Contractor shall provide, furnish and maintain a contract office for use by the Engineer and his staff on the site of the Works. The contract office shall be at a location provided by the Contractor and approved by the Engineer.

The required floor area and number of rooms are indicated in Sub-Clause 004.04 below and the Appendix to these General Requirements.

Basic required details of the office buildings together with details of the site arrangements are given in Sub-Clause 004.04. below.

The office shall be provided with new furnishings and fittings as specified in paragraph 004.07 below and the Appendix to these General Requirements.

The office building shall be completed and ready for occupation and use by the Engineer within 12 weeks from the Commencement Date. Failure to comply with this requirement will result to a penalty of 1000 EURO/ day calculated from the end of the 12 week period, and in a withholding of an additional EURO 100,000 from the subsequent interim payment certificate until the Contractor complies with this requirement.

On completion of the Contract, the office shall be demolished and removed from the site and the office location wholly restored to its original condition or, in the case of a brownfield site, shall be landscaped and revegetated to an acceptable standard.

### **004.03.        Laboratory Office**

The Contractor shall provide within the site laboratory specified in Section 005 below an office for use by the Engineer as specified in Sub-Clause 004.04 and Sub-Clause 004.05 and the Appendix to these General Requirements,

The office shall be provided with new furnishings, fittings and equipment as specified in Sub-Clause 004.07 below and the Appendix to these General Requirements.

The office for use by the Engineer shall be available at the same time as the laboratory becomes operational.

### **004.04.        Layout of Engineer's Contract and Laboratory Offices**

The Contractor shall submit details of all works necessary for the completion of the offices to the Engineer for approval based on the requirements of the whole of Chapter 004 and the Appendix to these General Requirements defining floor areas and number of rooms. The details of each office shall be submitted for the Engineer's approval within

28 days of the Letter of Acceptance. The Contractor shall be responsible for obtaining any necessary permits, licences, etc. for the work involved in providing the offices.

#### **004.05. General Requirements for Engineer's Offices**

A paved access road from the highway shall be provided to each office complex and covered hardstanding shall be constructed to accommodate the number of vehicles specified in the Appendix to these General Requirements. Each office complex and its covered and open hardstanding shall be surrounded by a 1.8 metre high security fence at least four metres from any external wall of the office. A lockable gate, sufficient for vehicle entry, shall be provided in the fence. The area within the fencing shall be well lit.

Throughout the construction period and for as long thereafter during the Defects Liability Period as the Engineer may require, the offices shall be maintained, repaired and serviced by the Contractor.

All buildings shall be insulated and weatherproof suitable for the climate. All windows shall be double glazed and have opening sashes. Entrances shall be provided with two sets of doors. Natural lighting and ventilation shall be provided to each room but adequate electric lighting shall be provided for working during periods of darkness. Every room shall be provided with at least three earthed electric power points with a total supply of 4 kilowatt per room.

Each room shall be provided with a split unit heating/cooling air conditioning unit suitable to maintain an internal temperature of 20 ° C to 25 ° C whatever the external temperature.

Ceiling heights shall be at least 2.6 metres.

Each building shall have an enclosed entrance lobby overlooked by one of the rooms.

Each kitchenette shall contain a sink, two base and two wall cupboards, a 150 litre refrigerator and a two-ring electric hotplate.

Wash-hand basins, showers and kitchenette sinks shall be provided with constant hot and cold water.

The layout, design, materials, workmanship, finishes, fittings and furnishings shall all be to the satisfaction on the Engineer.

The offices shall be properly cleaned by the Contractor daily for as long as they are required by the Engineer. Repairs to the buildings, contents and equipment, together with all services, shall be carried out by the Contractor immediately the need arises.

The Contractor shall make all arrangements for, and pay for, all necessary charges for installation and the continuous provision and maintenance of the following services to the offices:

- (a) Electricity for lighting and power,
- (b) Air-conditioning and heating,
- (c) Fresh potable water,
- (d) Hot water,
- (e) Disposal of sewage and waste water,

- (f) Disposal of solid waste,
- (g) International and local telephone and facsimile lines.

#### **004.06. Temporary Offices**

Pending completion of the Contract Office specified above, the Contractor shall provide temporary office accommodation at or near the site at a location to be approved by the Engineer for the use of the Engineer. This temporary office accommodation shall be provided within 21 days of the Commencement Date and before the Contractor commences the Permanent Works on site. The temporary office accommodation shall have at least 60% of the required floor area of the permanent office, shall be furnished and equipped to the Engineer's requirements to a level not exceeding that specified for the permanent office, shall have adequate washing and sanitary, and heating and cooling facilities and shall be maintained by the Contractor. Furnishings for the temporary office may be new furnishings and equipment which will subsequently form part of the furnishings of the permanent office.

#### **004.07. Furniture for the Engineer's Offices**

The Contractor shall supply new furniture and equipment as required by the Engineer of good quality suitable for hard and prolonged use. The list given in the Appendix of these General Requirements is indicative of the requirements but the Engineer reserves the right to make minor alterations to the list when the Contractor's organizational arrangements and the detailed layout of the offices are known. The Contractor shall obtain the approval of the Engineer for all items before purchase.

In addition to furnishings the Contractor shall supply at least two licensed copies of any proprietary software which the Contractor utilises for the design, control, planning and operation of the works. The computer software shall be in the English language and shall be licensed for use by the Engineer. The Contractor shall supply a complete set of operating manuals, in English, for all software.

All furniture procured for the offices shall revert to the Contractor at the end of the Contract or at such time that the offices are no longer required by the Engineer.

#### **004.08. Vehicles for the Engineer**

The Contractor is not required to provide vehicles for the Engineer.

#### **004.09. Communication Facilities for the Engineer**

The Contractor shall provide separate, direct international and local telephone lines and broadband internet access at the laboratory and contract offices. The Contractor shall allow for the purchase of the equipment and for rental, servicing and subscription costs and fees. The charges for international calls will be borne by the Engineer. The communication facilities shall be available at the same time as the offices in which they are located. Temporary offices shall be provided with at least local telephone and internet access services.

The Contractor shall pay all charges in connection with the use of these phones which shall be for non-international calls only. At the end of the Contract, and when no longer required by the Engineer, all communications equipment will revert to the Contractor.



#### **004.10. Miscellaneous Services for the Engineer**

The Contractor shall provide the Engineer with safety helmets, safety shoes, rubber boots, reflective jackets and any other necessary protective clothing. Sufficient items shall be provided for the Engineer's staff and visitors.

The Contractor shall provide the Engineer with such assistance as he may require at all times including weekends as assistance to the Engineer in the control and supervision of the works. Such assistance shall include, but not be limited to, assistance with sampling, laboratory testing and surveying. The Contractor shall provide men equal to the tasks required and shall maintain continuity of employment wherever possible.

#### **004.11. Housing for Engineer**

The Contractor is not required to provide housing for the Engineer.

##### **Measurement**

The Engineer's Contract office will be paid for as a lump sum to include all specified furnishing and equipment.

The lump sum for the Contract Office will be paid when the offices are handed over for use to the Engineer, complete and furnished, with all services connected and operational. A part payment may be made in respect of furnishings and if these are supplied for use in temporary offices as foreseen in Sub-Clause 004.06 above. Any such payment shall be not more than 75% of the demonstrated invoiced net cost of the items supplied.

If the office is to be removed at the conclusion of the works then the lump sum shall be split into 70% and 30% elements with 70% to be paid when the office is handed over to the Engineer and the remaining 30% to be paid only when the building has been demolished and the site restored to its original condition, or, in the case of a brownfield site, when the site has been landscaped and revegetated to an acceptable standard.

There will be no separate pay item for the Engineer's Laboratory office. The provision of this office including all specified furnishing and equipment will be deemed to be included in the pay item for the Laboratory.

No separate payment will be made for the maintenance and provision of services to the Engineer's office and laboratory office.

In the event that the Contractor fails to complete the works by the due date no payment will be made for maintenance of offices, or for the provision of services for the period between the scheduled completion date and the actual date of taking over. During this period the Contractor will be required to provide all maintenance and services to the Engineer at his own cost.

In the event that the Contractor fails to provide any of the items or services required under the contract for the Engineer, the Engineer shall provide such items or services and shall be reimbursed for them by the Employer. The cost of such provision by the Engineer shall be deducted from payments due to the Contractor and such deductions shall not be limited to the amounts calculated on the basis of the rates and prices in the Bill of Quantities but shall be the full cost of such provision as notified by the Engineer to the Employer.

## Payment

No.	Item	Unit of Measure
00401	Provide and furnish contract office	Lump-sum
00402	Maintain contract office	Month

## **CHAPTER 005.        LABORATORY**

The Contractor shall construct, to his own design, and as approved by the Engineer, a new building or a prefabricated building or shall refurbish a part of or the whole of an existing building to form the main laboratory for carrying out sampling and testing as required by the Specifications. The laboratory shall be on the site of, or close to the Contractor's main offices and convenient for the Engineer's contract office. The Laboratory shall be for the joint use of the Contractor and the Engineer.

The laboratory shall be of robust construction with smooth cleanable internal surfaces. It shall be insulated, heated, cooled and weatherproof suitable for the climate. The size and layout of the laboratory shall be appropriate for carrying out all sampling and testing of materials and workmanship. It shall contain special storage rooms for samples of materials etc. to the satisfaction of the Engineer. The building shall be provided with adequate ventilation and heating, with special ventilation and fume extraction provisions as necessary. A paved access road from the highway shall be provided and a hardstanding shall be constructed of sufficient area to permit the parking and manoeuvring of four vehicles belonging to the Engineer together with such additional space as may be required by the Contractor for his own vehicles. The building shall be within the Contractor's compound security area or shall have its own security fencing with lockable gate. The building shall contain an office for the Engineer as specified in Chapter 004 [*Engineer's Facilities*] and the Appendix to these General Requirements.

On completion of the Contract the Laboratory building shall be demolished and the materials removed from the site which shall be wholly restored to its original condition or, in the case of a brownfield site, shall be landscaped and revegetated to an acceptable standard

The laboratory shall be set up in accordance with any requirements of the Department for Measurements and Standards and with the requirements of this Contract. The Contractor shall provide the equipment and consumables necessary for carrying out all the sampling, testing and recording required by the Specifications and any additional testing instructed by or undertaken by the Engineer. The stock of equipment and consumables shall allow for usage, breakage, deterioration and replacement. All testing equipment, apparatus, etc. shall be new and maintained in a clean and serviceable state and shall be checked and/or calibrated at required intervals. An uninterrupted power supply to be established with continuous water (hot and cold) supply throughout the project period in the laboratory, if necessary a generator with adequate capacity to be provided. In the laboratory gas shall be available all through the project time. A good sanitation shall be maintained through out the contract period.

The Contractor shall also provide mobile facilities for sampling and testing which should or can be carried out in the field at the location of the Works.

The Contractor shall staff the laboratory with a qualified engineer and technicians fully experienced in all sampling and testing procedures relevant to the Works. The engineer

and technicians shall be supported by an adequate number of laboratory and field labourers.

The building shall be maintained, repaired and serviced by the Contractor whilst in use under the Contract and shall at all times be kept in a clean and tidy state.

The Contractor shall allow the Engineer unrestricted access to the laboratory so that he can witness any testing, inspect equipment, samples, records, etc. The Contractor shall undertake any additional tests required by the Engineer under the Contract and shall allow the Engineer to carry out his own tests for the Contract, using the Contractor's technical personnel as necessary.

The laboratory shall be completed and ready for use within 12 weeks of the Commencement Date. If the Contractor commences any selection or testing of materials for submission to the Engineer for approval or commences any Permanent Works before the laboratory is operational then approved alternative facilities must be available to carry out all tests required for the works in progress or the approval of materials submitted to the full requirements of the Specifications.

Laboratory equipment and apparatus shall remain the property of the Contractor and shall be removed from the site of the Works when no longer required by the Engineer and in any case no later than the end of the Defects Liability Period, unless directed otherwise in the Particular Conditions.

#### **Measurement**

The provision and equipping of the laboratory as described above will be paid for as a Lump Sum. The sum quoted shall include for any temporary alternative testing facilities. The Contractor shall provide with his bid a list of all necessary testing equipment for approval by the Engineer and the provision of all equipment, installed and in working order, on the approved list shall qualify as the provision of laboratory equipment for payment purposes. The provision of such a list and its approval by the Engineer and the delivery of the equipment on the list shall not relieve the Contractor of his responsibility to provide ALL necessary equipment for carrying out all tests which may be required for the approval of the works and the Contractor shall remain liable to supply any and all additional equipment which may be found necessary under the terms of the Contract during the execution of the Works.

#### **Payment**

The Lump Sum for the provision, equipping and operation of the laboratory will be paid as follows:

- 40% upon delivery of fully operational laboratory.
- 40% payable in instalments with each monthly certificate on a pro rata basis to the value of the work done excluding the General Items.
- 20% payable when the building has been demolished and the site restored to its original condition, or, in the case of a brownfield site, when the site has been landscaped and revegetated to an acceptable standard.

No.	Item	Unit of Measure
00501	Provide site laboratory including office for The Engineer	Lump-sum

## **CHAPTER 006. MISCELLANEOUS REQUIREMENTS**

### **006.01. Quality Assurance Management System**

The Contractor shall be wholly responsible for ensuring that the quality of materials and workmanship is in accordance with the requirements of this Specification and of the Conditions of Contract. The Contractor shall carry out his own inspection of materials and workmanship and satisfy himself that they meet the Specifications before offering them to the Engineer for acceptance or payment.

The Contractor shall prepare and submit to the Engineer within 56 days of the Commencement Date a written quality assurance management system similar to that described in the ISO 9000 series of standards. This shall show the Contractor's site organization in respect of quality assurance and shall demonstrate the Contractor's commitment to checking and reporting on the quality of materials and workmanship. It shall also show how the system will be extended to suppliers and sub-contractors and how all elements of the system will be documented.

The Contractor shall, before placing any order for materials for incorporation in the Works, submit for the information of the Engineer the names of the firms from whom he proposes to obtain such materials. He shall give descriptions, manufacturer's specifications, the quality, weight, strength and origin of the materials, as applicable, and confirm the quantities to be procured. The Contractor shall provide the Engineer with samples of materials when requested, details of the supplier's quality assurance system and, where appropriate, manufacturer's certificates of recent tests carried out on similar materials. In accordance with Clause 7.3 of the Conditions of the Contract the Engineer may require to visit the facilities of any manufacturer or supplier.

The Contractor shall carry out trials of all concrete mixes, bituminous mixes and mixtures of others materials to demonstrate that, not only are the constituents in compliance with the Specifications, but that the resultant mixtures also comply. He shall show as part of the quality assurance system the relationship between trial and job mixes and his proposals for maintaining the quality of all mixes on site.

The Contractor shall keep a Non-conformity register and a Concession Request register that shall be copied to the Engineer each month. Concession requests for materials or work that does not meet the requirements of the Specifications (as recorded in the non-conformity register) shall be forwarded to the Engineer as a part of the routine Quality Assurance inspection system (Request for Inspection System). Requests for Inspection of the works shall generally be forwarded to the Engineer not later than 17h00 for works to be carried out on the following day, to enable the Engineer to allocate personnel to do the independent checking.

### **006.02. Survey Beacons and Benchmarks; Setting Out**

Main beacons and benchmarks for defining the Works have been established on or near the road during the preparation of this project. Details will be given to the Contractor in writing by the Engineer before commencement of permanent works. In order to carry out his duties under Clause 4.7 of the Conditions of Contract, the Contractor shall establish from the beacons and benchmarks an adequate system of secondary benchmarks and control points for the execution of the Works which shall be clearly marked, adequately referenced and carefully recorded. The Contractor shall be solely responsible for carrying out this work and for the protection and re-establishment, if necessary, of all

primary and secondary setting-out points.

Should the Contractor find any discrepancies in the survey information provided, he shall immediately inform the Engineer in writing.

The Engineer may check the Contractor's system of secondary benchmarks and control points for the purpose of agreeing the setting out and measurement of the Works. The Contractor shall do everything necessary to facilitate any checking which may be carried out by the Engineer and shall safeguard any marks established by the Engineer during checking. The checking of any setting-out or of any line or level by the Engineer shall not in any way relieve the Contractor of his responsibility for the accuracy thereof.

In the case of foundations, earthworks or where the Engineer considers it necessary, the Contractor shall, in conjunction with the Engineer, take such original ground levels or other measurements as may be necessary to define the conditions prior to the start of work. Agreed levels and dimensions shall be recorded in writing, signed by the Contractor and Engineer, and shall form the basis of the measurement of such works.

The Contractor shall prepare Construction Drawings of all works to be undertaken, and shall submit these for the Engineer's approval in sufficient time for the review and approval of the Engineer. This shall be prior to the commencement of works in any section, and in any event not less than 7 days prior to commencing works related to the particular Drawings.

In the case of Construction Drawings for road pavement works, the Contractor shall, in conjunction with the Engineer, take existing levels of the road cross sections at intervals agreed with the Engineer, but in any case at a maximum interval of 10 metres. The Contractor shall prepare a revised longitudinal profile if necessary, for the Engineer's approval. The pavement cross-section drawings produced by the Contractor shall indicate both existing and finished levels, including different pavement layers as appropriate. The Contractor shall prepare Construction Drawings based on the design implicit in the contract drawings in sufficient detail to allow the works to be constructed and measured accordingly. For this, the Contractor shall provide relevant quantities and surface areas when the Construction Drawings are provided to the Engineer for approval.

### **006.03. Protection and Diversion of Services**

Wherever an existing overhead or underground installation carrying live services (gas, water, electric power, telephone, etc.) is to be diverted in order to perform the Works, the Contractor shall arrange for this work to be carried out by the owner of the installation. The Employer will have obtained prior approvals from the owners regarding diversion/removal of services shown on the Drawings but the Contractor shall be responsible for agreeing the programme for the work and for paying any necessary costs and fees through the Contract as instructed by the Engineer. The Contractor shall provide attendance as necessary and shall have general responsibilities for protecting the installation before, during and after diversion/removal.

Whenever during the execution of the Works the Contractor locates service installations which require diversion/removal and which are not shown on the drawings, he shall immediately notify the Engineer. The Engineer will liaise with the Employer and owner of the service to obtain the necessary actions.

In the case of service installations within or close to the Site but which do not require diversion/removal, the Contractor shall be wholly responsible for the support and protection of the service during adjacent permanent works to the satisfaction of the Engineer and the owner of the service.

The Contractor shall inform the relevant office of the owner of any service which is damaged during the course of the Works and shall, at his own cost, repair the damage or arrange for the service owner to do the repairs or arrange for a third party acceptable to the service owner to do the repairs.

Contractor shall be responsible for the liaison with the concerned authorities having jurisdiction.

#### **006.04. Sequence of Key Contract Activities**

Within the 28 day period from the Letter of Acceptance the Contractor is required to have:

- executed the Contract Agreement (Sub-Clause 1.6, Conditions of Contract);
- submitted an acceptable Performance Security; (Sub-Clause 4.2, Conditions of Contract)

A notice to commence the works shall be issued by the Engineer in accordance with Sub-Clause 8.1 of the Conditions of Contract. However permanent works shall not commence until the Contractor has satisfied the Engineer regarding the following:

- arranged all insurances (Clause 18 of the Conditions of Contract);
- provided permanent or temporary offices for the Engineer as specified;
- provided a functioning laboratory or made approved alternative arrangements;
- submission of the names and details of key personnel;
- In the case of roadworks, provided a traffic management plan acceptable to the Road Traffic Police.

The Contractor shall provide a detailed programme according to Sub-Clause 8.3 of the Conditions of Contract within 28 days of receiving the notice to commence the works. This shall include the following:

- a detailed time schedule including allowance for the Contractor's Documents (Construction Drawings), materials approval and procurement, manufacture of permanent Plant for the works (if any), delivery to Site, construction and testing;
- a time schedule that identifies the sequence, frequency and timing of tests required in the Contract in conjunction with the item above;
- a general method statement for the Works
- an estimate of the number and class of Contractor's Personnel and Contractor's Equipment required for each activity
- A cash flow in conjunction with the first item above.

At the time that possession of site is given, a site inspection shall take place, attended by representatives of the Engineer, the Contractor and the Employer, to record the general conditions and locations of road signs, street furniture and any other items, and to determine the measures necessary to safeguard such facilities.

#### **006.05. Record Drawings**

The Contractor shall prepare and provide to the Engineer accurate record drawings to the same general scales as the contract drawings, showing Works as executed complete with original and finished levels. The record drawings must show all significant features of the rehabilitation works so as to form a complete pictorial record of the finished Works. The record drawings are part of the Contract Documents, and shall be based on the Construction Drawings referred to in Subsection 006.02 above, modified according to any instruction received from the Engineer during construction. The Drawings shall show details of all utilities affected by the Works.

During the course of the work, the Engineer shall have the right to call for records drawings so that he may check them for accuracy and completeness. The record drawings shall be reproducible and the original and two prints shall be submitted to the Engineer as soon as possible after the work is complete but no later than the end of the Defects Notification Period.

#### **Payment**

Payment for the requirements set out in Chapter 006 [*Miscellaneous Requirements*], shall be deemed to be included elsewhere within the cost items of the Bill of Quantities, except as hereinafter specified, and where no payment is clearly specified elsewhere in this document the costs of actions necessary to fulfil these requirements shall be deemed to be included within the existing cost items of the Bill of Quantities.

### ***CHAPTER 007. TRAFFIC MANAGEMENT***

The Contractor shall take note of the fact that the rehabilitation works are to be carried out while maintaining traffic flows and that the works will, in general, have to be undertaken in half-widths of the road. Road closures will not generally be permitted.

The Contractor shall, throughout the execution of the Works and the Defects Liability Period have full regard for the safety of all persons, whether entitled to be on the Site or otherwise, and keep the Site (so far as the same is under his control) and the Works in an orderly state appropriate to the avoidance of danger to such persons. The Contractor shall provide and maintain all lights, barriers and warning signs, when and where necessary as hereinafter specified for the protection of the Works and for the safety and convenience of the public.

The Contractor shall use all appropriate means to avoid traffic disturbance during the Works. Before the Commencement Date he shall submit for the Engineer's approval an outline traffic management scheme. The scheme shall accompany and shall be coordinated with the construction programme required under Sub-Clause 8.3 of the Conditions of Contract.

Traffic management schemes with their signs, markings, signalling and lighting shall be

in accordance with Moldovan standards, as set out in Methodological Norms regarding conditions for traffic restrictions during execution of road works within public road area approved by joint order of Ministry of Internal Affairs and Ministry of Transport and Road Infrastructure No.194/108, dated May 25, 2005, for every road restriction or diversion. A detailed scheme shall be submitted for the Engineer's approval before any road restriction or diversion is implemented. Management schemes shall include;

- A detailed diagram showing the location of all traffic control devices, including advance warning and speed limit signs, arrangements for lane closure, including lengths to be closed and duration of closures, location of flagmen or traffic control signals, means of communication between flagmen.
- A tabulation of all traffic control devices shown on the diagram.
- An access maintenance plan for all properties along the road length subject to restriction/ diversion.
- Provision for pedestrians.

Schemes shall be submitted sufficiently early for the Road Traffic Police, the Engineer and State Road Administration to give their approval, and in any event not less than 7 days before the commencement of the planned road works. The Contractor shall take all necessary measures to direct traffic at diversions and on bridges under repair during both daytime and night time. No work on a section of road shall commence unless the Engineer has satisfied himself that the approved scheme is operating satisfactorily.

Individual one-way traffic restrictions shall not be longer than 500 m unless agreed otherwise by the Engineer. The objective is to avoid unnecessary traffic waiting time or long queues. The Contractor must demonstrate that he has considered traffic transit times at restrictions, queuing times, safe stopping distances and overtaking distances when proposing lengths of one-way working and the distance between such lengths.

All diversion roads and road lengths subject to traffic restrictions shall be maintained in a good condition at all times. The width of traffic lanes shall generally be at least 3.5 metres and in no case less than 2.8 meters wide. The Contractor shall introduce measures to minimize irregularities and steps on the pavement surface during repairs and overlay operations. Where phased construction results in low shoulders, these shall be clearly signed throughout the length involved. The Contractor shall ensure that his operations do not impede snow clearing work in any way and that equipment and materials are kept clear of roadways outside working hours.

The Contractor shall appoint and give the necessary authority to a suitably experienced and qualified person to supervise all traffic management and safety matters relating to the Contract and notify the Engineer accordingly.

During the Works Execution period Contractor shall organize and maintain the road traffic, with exception of specific maintenance works during winter period (snow and glazed frost cleaning). During the winter period Contractor shall (i) maintain the traffic throughout the zones of unfinished construction; and (ii) provide pavement related routine maintenance including repairing potholes, patching and preserve the unfinished constructions.

In accordance with the current legislation, the Contractor shall be responsible for the road accidents caused by the non-compliance with the contract provisions and the traffic management requirements during the execution of the road works by the Contractor or his Subcontractors.



**Measurement**

Traffic management measures of all kinds as outlined above or as necessitated by any other requirement of the Contract will be measured as a Lump Sum.

**Payment**

The Lump Sum for traffic management will be paid in equal monthly instalments throughout the construction period.

Traffic management and safety during construction shall be regulated in 2 stages as follows:

Stage 1: Number and type of safety devices shall be as per the requirement shown in the drawings or as directed by the engineer during construction and maintenance of the same for the entire period of particular construction zone.

Stage 2: Continuous maintenance of the above, with all barricades, traffic cones, reflective tapes, signs, flagmen, lamps/blinkers etc., as per the drawings or as directed by the engineer.

In the event of persistently inadequate measures under this item for any month during the construction period the Engineer may deduct the monthly instalment amount for that month. Any such amounts deducted shall not be recoverable later.

No.	Item	Unit of Measure
00701	Manage & maintain traffic throughout the period of the works	Lump-sum

***CHAPTER 008. INSURANCES AND PERFORMANCE GUARANTEE***

The Contractor shall provide insurance in accordance with Sub-Clause 18 of the Conditions of Contract and of the Contract Data and shall provide a Performance Guarantee in accordance with the requirements of Sub-Clause 4.2 of the Conditions of Contract and of the Contract Data.

The Employer's personnel shall be included in the insurance coverage.

The pay item for insurance will be full compensation for all insurances required to be provided by the Contractor under the Contract. Payment will be made after all insurances have been taken out to the satisfaction of the Employer and the Engineer and copies of the policies and evidence that all initial premiums have been paid have been presented to the Employer. Payment will be made in two parts; 50% payable in the first Invoice for works done and 50% payable in the first invoice 12 months after the Commencement Date.

The pay item for provision of the Performance Guarantee shall be full compensation for the provision of the guarantee in conformance with the requirements of the Contract. Payment will be made after the Performance Guarantee, in a form conforming to the requirements of the contract, both as to terms and to duration, shall have been submitted to and approved by the Employer. Payment will be made in three equal parts; one third

payable in the first Invoice for works done following acceptance of the guarantee, one third payable in the first invoice 12 months after the Commencement Date and one third payable after the issue of the Taking over Certificate.

#### **Payment**

Pay item: Insurance Pay unit: Lump Sum

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
00801	Provide Insurances	Lump-sum
00802	Provide Performance Guarantee	Lump-sum

## **CHAPTER 009. CONTROL OF MATERIAL**

### **009.01. Source of Supply and Quality Requirements**

The Contractor selects all sources by itself and provides acceptable materials that meet the requirements of the Contract and Specification, to the satisfaction of the Engineer. The Contractor shall notify the Engineer of all proposed sources before delivery to the Site, and shall expedite material inspection and testing according to the requirements of his construction programme. The Contractor undertakes that he will not incorporate any material requiring submittal testing into the permanent work until they are approved by the Engineer.

Material must be approved at the source of supply before delivery to the Site. This approval does not constitute acceptance of material. If an approved source does not continue to supply acceptable material during the contract period, the source may be subsequently rejected.

The Contractor shall take note of the requirements of Sub-Clause 006.01 [*Quality Assurance Management System*] regarding Quality Assurance during the process of selecting and providing materials to the Works.

### **009.02. Local Material Sources**

Sources of rock, sand, gravel, earth, or other natural material located by the Employer in the project are identified in the documents.

These identified sources listed may be used by Contractor. The decision to use an identified source is solely that of the Contractor.

The Contractor shall be concerned of limited available sources of aggregates for asphalt mixture (granite) in the Employer's country and availability of transport means for supply.

- **Employer listed sources**

The Employer may list possible material sources. The Employer makes no representation about quality or quantity of material, or rights to the availability of material from these sources. These sources are considered to be Contractor - located sources under (b) below.

- **Contractor located sources**

The Contractor is responsible for these sources, including existing commercial sources. Use sources that fulfil all the contract requirements and the sufficiency of quantities is the sole responsibility of the Contractor. The Contractor shall determine the quantity and types of equipment and work necessary to select and produce acceptable material and shall secure all clearances for use of the source and provide copies of the relevant documents to the Engineer.

The Contractor shall provide laboratory test reports and available historical performance data indicating that acceptable material is available from the source. The Contractor shall not use material from a source that is unacceptable to either the Engineer or the Employer and shall dispose of unacceptable material and locate another source at no cost to the Employer.

### **009.03. Storing and Handling Material**

The Contractor shall store and handle material to preserve its quality and properties for the works and in a manner acceptable to the Engineer. Stored material approved before storage, may again be inspected before its use into the work. The Contractor shall locate stored material in a manner to facilitate prompt inspection.

The Contractor shall use only approved portions of material correctly stored and the placement of plant and equipment, and shall ensure compliance with the requirements of the Environmental Management Plan. Material subject to deterioration from prolonged storage shall be used before its expiry dates and in the sequence of its dates of delivery or its dates of manufacture whichever is more applicable

The Contractor shall provide all additional space needed and shall not use private property for storage without written permission of the owner or lessee. The Contractor shall furnish copies of all agreements to the Engineer and shall restore all Employer provided storage sites to their original condition.

The Contractor is responsible for the security of all stored material.

### **009.04. Use of Material Found in the Work**

The right to use and process material found during the work does not include the use and processing of material for other work except for the disposal of waste material. Waste material may be disposed of on site if approved by the Engineer, or off-site at approved locations. The Contractor shall be responsible for locating and securing off-site waste areas if required, at no additional cost to the Employer.

Milled material from the existing road pavement shall be stockpiled for reuse at locations selected by the Contractor and approved by the Engineer.

If the Contractor produces or processes material from the Employer's lands in excess of the quantities required by the contract, the Employer may:

- Take possession of the excess material and direct its use, paying the Contractor only for the cost of production, or
- Require removal, replacement with suitable fill material and restoration of

the over-excavated area to a satisfactory condition at no additional cost to the Employer.

## **CHAPTER 010. CEMENT**

### **010.01. Portland and masonry cement**

The cement shall comply with the requirement of GOST 10178-85 and SNiP 3.06.04-91 annex 3.

For procurement of the Cement the Contactor shall submit Manufacturer's test certificate with other relevant documents of the company to get approval of the Engineer.

### **010.02. Cement for mortar**

Cement for mortar shall be to GOST 25328-82. Different types or marks of cement or the same mark or types of cement from different consignments shall not be mixed without the Engineer's approval.

### **010.03. Storage**

The right conditions for cement storage and protection against dampness must be provided. Cement shall be stored in cool, dry, closed sheds. Cement shall not be stored in the open, on the ground, or under plastic sheeting.

Under no circumstances shall cement showing any signs of the following damage or mistreatment be used:

- partially hardened cement
- adulterated cement
- Cement from bags opened previously.
- cement from damaged bags

## **CHAPTER 011. BITUMEN**

### **011.01. Bitumen**

Bitumen will be provided according to SM GOST 22245-90 for the grade indicated in drawings or technical specifications.

In addition to the SM GOST requirements, bitumen used in asphalt mixes shall comply with the following requirements:

<b>Grade</b>	<b>60 – 90</b>	<b>90 – 130</b>
Dynamic Viscosity at 60 deg C Pa.s minimum	295	230

For procurement of the Bitumen the Contactor shall submit Manufacturer's test certificate with other relevant documents of the company to get approval of the Engineer. Test certificates shall be submitted to the Engineer for every delivery of the bitumen to site.

No test method is given for viscosity. Kinematic viscosity at 60 and 135 °C can, in theory, be measured using Capillary viscometers, AASHTO test method T201. However, in practice only T 202 (dynamic viscosity by vacuum capillary) is suitable for penetration grade bitumen at 60 °C. More conveniently, dynamic viscosity can be measured using a rotating spindle type mechanical viscometer; eg Brookfield viscometer.

For bitumens where penetration is specified with limits different to those quoted above the viscosity requirements shall be determined by the Engineer based on a pro rata interpolation from the above table.

Note that for bitumen acceptance purposes dynamic and kinematic viscosity may be equated on the basis of  $1\text{Pa}\cdot\text{s} = 1000\text{sq. mm/s}$

### **011.02. Bituminous emulsion**

Bituminous emulsion will be provided according to SNiP 3.06.03-85 and GOST 18659-81.

### **011.03. Working temperature**

The binder will be used at the temperatures indicated in SNiP 3.06.03-85.

## ***CHAPTER 012. AGGREGATE, FILLER***

### **012.01. Aggregates and sand for cement mortar and Portland cement concrete**

The aggregates, ballast, and sand used for concrete works, bridges and viaducts will be in accordance with GOST 26633-91 and SNiP 3.06.04-91 annex 3.

The aggregate size distribution in the concrete will be between the limits indicated into the Table 1 of SM GOST8267-93.

Crushed stone aggregates will be according to SM GOST 8267-93.

The sand for mortar and concrete will be in accordance to SM GOST 8736-93.

### **012.02. Crushed stone for road base, binder course and wearing course**

The aggregates will result from durable crushed stone in accordance to SNiP 2.05.02-85, SM GOST 25607-94. Only crushed stone without organic additions or clay shall be used. Stone susceptible to freezing-thaw cycle or liable to be blistered in moisture shall not be used.

The right size distribution of the aggregates will be provided under crushing, sizing and mixing system. Small size aggregates, passing 4.75 mm screen will be natural or crushed sand.

### **012.03.     Aggregates for bituminous mixtures**

The aggregates for hot mixtures will be crushed granite. The size, quality and structure of the aggregates will be in accordance to SM STB 1033:2008.

The mixture will not have organic additions. The percentage of clay and soft particle will be less than 0.5%.

### **012.04.     Sand**

The sand used for bituminous mixtures will be in accordance to SM GOST 8736-93.

The sand for the road base will be in accordance to SNiP 2.05.02-85.

### **012.05.     Filler**

The filler used for hot bituminous mixture will be in accordance to SM GOST 16557-78.

### **012.06.     Additives for cement mortar and concrete**

Additives/admixture for cement mortar and concrete shall not be used without prior consent of the Engineer. The approved admixtures/additives shall be used in accordance to SNiP 3.06.04-91 Annex 3

Use of additives may be considered for:

- improving concrete's workability and reducing of water cement ratio
- improving frost resistance
- improving the impermeability of concrete
- assisting setting of concrete in negative air temperature

## ***CHAPTER 013.       REINFORCEMENT STEEL***

### **013.01.     Reinforcement steel**

Reinforcement steel for reinforced concrete shall comply with the following standards:

- SM GOST 5781-82\*\*
- SM GOST 6727-80\*
- SM GOST 7348-81\*
- SM GOST 23279-85
- SM GOST 13840-68
- SM GOST 103-76\*\*
- SM GOST 82-70\*

## **CHAPTER 014. OTHER MATERIALS**

### **014.01. Water**

The water used for cement concrete and mortar, aggregates washing and concrete curing will be in accordance to SM GOST 23732-92.

### **014.02. Paints**

Unless otherwise indicated the protection of metallic elements will be done using paints in accordance to SNiP 2.03.11-85.

### **014.03. Geotextiles**

Unless otherwise indicated the geotextiles will be in accordance to AASHTO M288.

#### **Introduction**

The works under this chapter comprise the provision and placing of geotextile fabric for the use as filter media in drainage works.

#### **Materials**

##### Geotextile filter membrane - General requirements

Identification of the geotextile products according to EN ISO 10320 "Geotextiles and geotextile related products – Identification on site" shall be enabled.

The geotextiles have to comply with the general requirements as set down in EN 13249 "Geotextiles and geotextile related products – Characteristics required for use in the construction of roads and other trafficked areas (excluding railways and asphalt inclusion)". The characteristics, their relevancy to the conditions of use, and the test methods to be used are given in Table 1 in EN 13249. The geotextile products have to fulfill all the conditions and requirements set in EN 13249 for CE-marking and FPC (factory production control) and have to be assigned durable > 25 years (according to Appendix A in EN 13249).

Table X1 Required characteristics, standardised test methods and type of requirements

<b>Required characteristic</b>	<b>standardised test method</b>	<b>Requirements (nominal value +/- tolerance)</b>
Mass per unit area	EN 965	Maximum tolerance value
Tensile strenght	EN ISO 10319	Minimum strength
Average value MD and CMD		Maximum tolerance value
Static puncture	EN ISO 12236	Maximum tolerance value
Tensile strain at max load	EN ISO 10319	Minimum elongation
Average value MD and CMD		Maximum tolerance value

Strain energy Index	EN ISO 10319	Minimum energy index
Dynamic perforation resistance	EN 918	Maximum hole size
		Maximum tolerance value
Characteristic opening size, Q90	EN ISO 12956	Maximum characteristic opening size
		Maximum tolerance value
Permeability normal to the plane without load	EN ISO 11058	Minimum velocity index
		Maximum tolerance value

The required values for each characteristic and corresponding maximum tolerance limits are given in Table X.2. All requirements in Table X.2 are regarded as figures corresponding to 95% confidence limits and related to the nominal value +/- the tolerance value as stated by the manufacturer.

Table X.2 required values corresponding to 95% confidence limits

Characteristic	Maximum tolerance	Required value corresponding to 95% confidence. Limit				
		Specification profiles				
		1	2	3	4	5
Min. tensile strength (kN/m), Fa,95	- 10%	6	10	15	20	26
Min. tensile strain at max. Load (%), Ea,95	- 20%	15	20	25	30	35
Max. con drop diameter (mm)	+ 20%	42	36	27	21	12
Min. Energy index (KN/m), Ra,95		1,2	2,1	3,2	4,5	6,5
Min. velocity index, (m/s)	- 30%	3	3	3	3	3
Max. char. opening size, (mm)	+ 30%	0,2	0,2	0,2	0,15	0,15
Max. tolerance for mass per unit area		21%	12%	10%	10%	10%
Max. tolerance for static puncture strength		-10%				

The specification profile No 2 of Table X.2 shall be applied.

A Certificate of Compliance for the paving fabric used on the project shall be furnished by the manufacturer to the engineer. The paving fabric shall be supplied in protective a cover or wrap that is capable protecting the fabric from ultraviolet rays, abrasion, and water.

### Handling and Installation

Materials shall be handled and stored in accordance with the manufacturers instructions.

Geotextile used as filter material shall be laid in the positions indicated over lightly rammed surfaces of natural earth which have been carefully trimmed to the correct lines, levels and shapes. Where fabric must join, the joint shall be made with an overlap of at least 100mm carefully pinned or stapled in place to ensure that the fabric surfaces remain pressed close together after completion of the supervening works, where three dimensional shapes have to be formed, rather than cutting and joining fabric, use should be made of pleats or darts



## **CHAPTER 015. OCCUPATIONAL HEALTH AND SAFETY**

Before commencing construction, the Contractor shall prepare and submit to the Engineer a formal document entitled "Health and Safety Plan". This Plan shall describe clearly the measures which the Contractor will be taking to ensure, so far as is reasonably practicable, the health, safety and welfare at work of his employees including those of his sub-contractors and of all other persons on the Site .

The Plan must include, but is not limited to, provisions to deal with the following problems, hazards and requirements:

- Welfare measures at the site, including at the accommodation. The Plan shall include access to fresh drinking water, washing facilities, toilets, shelters for use on breaks, etc.
- Means of separation of working and traffic areas (Speed restrictions, marking, fencing, etc.)
- Demolishing existing structures can entail exposure to high noise levels, vibration, dust and falling debris. The Plan shall explain how machinery noise and vibration will be mitigated and what personal protection measures will be taken. (Hearing protection devices, dust masks, protective clothing, etc.)
- Handling raw materials (soils, aggregates, gravels, rock, etc.) and construction of embankment, subgrade and pavement layers all entail exposure to dust, noise, vibration and heavy manual handling. The Plan shall describe measures which will be taken to minimise exposure to dust (watering, provision of masks), reduce noise and vibration to a practicable minimum (the highest acceptable noise level shall be 85 dBA ) and what mechanical equipment will be used to reduce manual handling. The Plan should also define what level of manual handling will be required after all mitigating measures have been implemented.
- Working with bituminous materials, especially when hot, entails exposure to the risk of severe burns and to fumes which, if inhaled will cause severe respiratory organ irritation and which are believed to be carcinogenous. Bitumen itself is a suspected carcinogen and skin contact should be avoided even when cold. The Plan should describe how contact will be minimised (protective clothing), how fumes will be avoided (masks, working practices such as keeping upwind of hot bitumen), general safety equipment (numbers and locations of fire extinguishers) and the level of first aid provision at the sites of bitumen transfer, preparation and application (spraying) including presence of trained personnel, first aid supplies, first aid equipment and easy access to clean water.
- Similar consideration must be given to the problems of working with more flammable materials, especially fuels. In addition to first aid, etc. the Plan must detail safe refuelling procedures to be employed for all static and mobile plant and vehicles.
- Handling of lime (especially quick lime), cement and other activators and additives is potentially hazardous. The Plan must describe adequate measures which will be taken to avoid eye and skin contact and inhalation (goggles, protective clothing and masks) and to minimise manual handling.

- Maintenance of vehicles and machinery frequently involves contact with solvents. The Plan should describe how skin and eye contact with and inhalation of solvents will be minimised through the provision of protective clothing and good working practices.
- Wherever dust masks are to be provided these should preferably be of the type with exhaust valves, making them easier to use. Rubber masks with removable filters are preferable to paper masks as they generally fit better and they can be used with different filters for different purposes (dust, solvents, etc.)
- To ensure that workers understand the occupational health and safety risks on the work site, and that they are aware of the measures available to minimise these risks, instruction and training must be given. The Plan must describe the instruction and training to be given and explain how it will actually be delivered to the workforce.
- As a minimum, of direct relevance to operations on the site, instruction and training must include the dangers of noise, vibration, dust, fumes, traffic, heavy equipment and heavy manual handling and must explain what measures are available to minimise these dangers, including the use of protective clothing, including protective footwear, reflective vests, hard hats, hearing protection devices, protective eyewear, and gloves, as may be necessary. The use of the required protective clothing shall be mandatory for all employees on the Site.

In addition to the direct dangers resulting from working on a construction site, the other dangers arising from living on the site must also be covered in the Plan which must explain how information relating to everyday health matters will be comprehensively conveyed to the workforce. Information to be disseminated must include, but is not necessarily limited to, warnings concerning the health risks of malaria, bilharzias, yellow fever, hepatitis, meningitis, hook worms, tape worms, intestinal worms, giardia, amoebae, venereal diseases, HIV-AIDS, scorpions, snakes and stinging insects.

The Plan will acknowledge the Contractor's responsibility for the health, safety and welfare of his workforce and describe these responsibilities in detail.

As well as preparing the Plan for Health and Safety the Contractor shall provide, equip and maintain adequate first aid stations throughout the Works, and he shall erect conspicuous notice boards directing where these are situated and shall provide all requisite first aid transport. The Contractor shall comply with the government medical or labour requirements at all times and provide, equip and maintain first aid stations in easy reach of all his operational areas and wherever else directed and shall at all times have experienced persons trained in first-aid available throughout the Works for attending to minor injuries.

## ***CHAPTER 016. COMPLIANCE WITH ENVIRONMENTAL MANAGEMENT PLAN REQUIREMENTS***

In accordance with the environmental policies of both the Employer and the donor an Environmental Management Plan (EMP) has been drawn up which the Contractor is required to implement throughout the construction process. The Contractor shall provide

a detailed site-specific Environmental Management Plan (EMP) which will be based on the Environmental Management Plan (EMP), including all activities mentioned in the ESAP that forms part of the Loan Agreement, has been drawn up which the Contractor is required to implement throughout the construction process. The Contractor shall provide a detailed site-specific Environmental Management Plan (EMP) which will be based on the Environmental Management Plan (EMP) and the required method statements / plans as described. The EMPs have to be in accordance with the Contractor's finalized work/method statements and schedules.

The essential requirements of the EMP are given below. Many of these requirements are incorporated directly into items of this Specification, however, the Contractor is cautioned that every point identified below must be scrupulously observed throughout the execution of the project and that all costs of meeting the environmental requirements are deemed to be included in the Contractor's quoted rates and prices, whether or not a specific pay item exists.

#### **016.01.      Revegetation**

All cutting and embankment slopes spoil heap and borrow pit slopes and areas of camps and other temporary works must be revegetated with plants, shrubs and grasses approved by the Engineer. At the Completion of the Works there shall be no exposed, unvegetated soils remaining on either the permanent or the temporary works, including the sites of camps, work stations, etc. On embankments in excess of 3 metres in height the revegetation measures shall include provision of continuous screening using shrubs and bushes at the back of the soft shoulder to a height of at least 1.5 metres.

#### **016.02.      Unnecessary compaction of soil**

Every effort shall be made to avoid unnecessary compaction of soil. Where such compaction is unavoidable, eg. In temporary accesses or camp areas, the Contractor shall take all necessary steps to ensure that soil is loosened and aerated over the full depth of compaction prior to the revegetation process.

#### **016.03.      Contamination of Watercourses**

Contamination of water courses must be prevented. The Contractor shall schedule works adjacent to waterways to take place strictly within the dry season.

#### **016.04.      Waste Oils, Fuel and Bituminous Materials**

Waste oils, fuels, bituminous materials shall only be disposed of in a manner approved by the environmental authorities. Such materials shall in no case be indiscriminately discarded or abandoned.

#### **016.05.      Dust**

Unpaved roads shall be regularly watered to restrict dust caused by construction traffic. Regular watering means watering at a sufficient frequency to ensure that the running surface is always damp while the roads are in use by construction traffic.

#### **016.06. Covering Loads**

All trucks carrying fine material or materials likely to shed dust shall have their loads tightly covered.

#### **016.07. Emissions**

Construction equipment shall be properly maintained to ensure that emissions are within the manufacturers published tolerances. Asphalt plants shall be fitted with dust filtering equipment and no significant emissions of dust will be permitted.

#### **016.08. Noise Levels**

Equipment with high noise levels shall be restricted to working during the hours of 0800 to 1800 and shall only be operated on normal working days. Noise level restrictions may be eased by the Engineer if he is satisfied that the affected location is entirely out of earshot of any potentially affected community and appropriate protective measures have been implemented, such as the use of hearing protective devices and noise mitigating devices on equipment. High noise level equipment shall be defined as equipment which generates a noise level in excess of 85 dBA at a distance of 10 metres under normal working conditions.

#### **016.09. Noise Barriers**

If so directed the Contractor shall utilise noise barriers to protect critical areas (schools, hospitals, etc) from the effects of high noise level equipment.

#### **016.10. Siting of Camps, etc, disposal of camp waste**

The Contractor's temporary works (Camps, quarries, borrow pits, spoil heaps, haul roads, etc.) shall be sited only with the approval of the authorities having jurisdiction.. All necessary permits for the construction of temporary and permanent works shall be obtained and copies lodged with the Engineer before ground is broken. Camps in particular shall have every aspect of service provision and waste disposal clearly defined and approved by the local authorities and the Engineer, before any aspect of construction commences. Throughout the operation of the temporary works the Contractor shall ensure that waste material of all types is contained and disposed of only by approved means. Comprehensive sanitary facilities shall be provided at all times in all areas where work is in progress.

#### **016.11. Opening and Operating Quarries and Borrow Pits**

No quarry, borrow or spoil area shall be opened without the prior approval of the Engineer. Prior to seeking formal approval for such an area the Contractor shall prepare a detailed working plan setting out the location, area, proposed depth/height and the proposed sequence of working. The plan shall also include full details of the proposed restoration measures, including details of grading and shaping, drainage, sediment control, soiling and revegetation measures. All quarries, borrow and spoil areas shall be adequately fenced to prevent unauthorised entry by the public during the Works. The extent and nature of any permanent fencing (if any) to be left in place at the end of the Works shall be clearly defined in the approvals of the authorities having jurisdiction and shall be clearly indicated in the working and restoration plans submitted. Permanent

fencing shall be of a nature, type and durability of construction approved by the Engineer and by the authorities having jurisdiction and shall be in a new condition at the time of taking over. Fencing of quarry, borrow or spoil areas, whether permanent or temporary, shall be deemed a part of the cost of operating such facilities and shall be borne by the Contractor.

#### **016.12. Undesirable Habitats**

Vector ecology shall be assessed and controlled in all areas of the works and the creation of undesirable habitats (eg. standing or stagnant water) shall not be permitted to occur.

#### **016.13. Hazardous Materials**

All hazardous, or potential hazardous materials (including but not limited to fuels, oils, bituminous materials, cement) shall be stored in dedicated compounds or buildings with full protection from possible effects of leakage or spillage. All waste or surplus materials shall be disposed of using approved processes guaranteed to cause no environmental ill effects.

#### **016.14. Access Routes**

All access routes to areas temporarily occupied by the Contractor shall be routed to avoid environmental damage. Such routes shall be approved by the Engineer before being created. If he sees fit the Engineer shall take advice from the environmental monitors before approving such routes.

#### **016.15. Cutting Trees**

The Contractor shall at all times take necessary steps to minimise destruction of trees and vegetation. He shall ensure that his personnel do not, at any time, undertake unauthorised tree cutting or clearance.

#### **016.16. Hunting, etc.**

The Contractor shall forbid his personnel to fish, hunt, kill, injure or poach any fauna or unnecessary damage any flora.

#### **016.17. Access to Properties**

All existing property with accesses to the project road shall be respected throughout the execution of the Works. Wherever a property has an existing access the Contractor shall ensure, through the provision of suitable temporary works, that such access remains available to the property occupier during the Works to substantially the same extent as previously.

#### **016.18. Public Meetings**

The Contractor shall take necessary measures, including public meetings, to ensure that the public is kept fully aware about the extent and scheduling of the proposed works. He shall ensure that at least one member of his staff is available during working hours to deal with queries and complaints from the public in respect of his operations.

#### **016.19. Environmental Health and Safety Officer**

The Contractor is responsible for Environmental, Health and Safety (EHS) matters across the whole site of the Works. The Contractor shall appoint one responsible member of his staff to act full-time as the Environmental, Health and Safety Officer, and he shall notify the Engineer of such appointment. The Environmental, Health and Safety Officer shall be experienced in all matters relating to the environment, health and safety on Sites and shall be familiar with all relevant environment, health safety regulations and legislation. The Environmental, Health and Safety Officer shall have the power to receive instructions from the Engineer on matters relating to the environment and the health and safety of personnel on Site and the safe conduct of site operations.

##### **Measurement**

Measures to ensure compliance with the Environmental Management Plan Requirements of all kinds as outlined above or as necessitated by any other requirement of the Contract will be measured as a Lump Sum.

##### **Payment**

The costs and expenses for compliance with the Environmental Management Plan Requirements shall be included in the rates and prices entered by the Contractor in the Bills of Quantities.

# APPENDIX TO GENERAL REQUIREMENTS SPECIFICATIONS

## 1. List of standards incorporated by reference

No./ Nr.	Type of Standard/ Tipul normativului	Title Definition
		Definitie titlu/denumire
1.	NCM A.06.01-2006 (MCH 2.03-02 2002)	Technical protection of the territory, buildings and constructions against dangerous geological processes. General data.
		Protectia tehnica a teritoriului , cladirilor si constructiilor contra proceselor geologice periculoase. Date Generale.
2.	NCM C.04-05-95	Natural and artificial lighting
		Iluminatul natural si artificial
3.	NCM F 01.03-2009	Rules of execution, quality control and acceptance of foundation soils and foundations.
		Reguli de executie, controlul calitatii si receptia terenurilor de fundare si a fundatiilor
4.	NCM F 02.04-2007	Precast concrete elements, reinforced concrete and prestressed concrete. Performance, quality control and acceptance.
		Elemente prefabricate de beton, beton armat si beton precomprimat. Executarea, controlul calitatii si receptia
5.	SNIIP 2.01.14-83 Replaced by CP D.01.04-2007	Determination of Design-Basis Hydrologic Characteristics
		Determinarea Caracteristicilor Hidrologice de Baza de calcul.
6.	SNIIP 2.02.02 – 85*	Foundations of water retaining structures.
		Fundatii hidrotehnice
7.	SNIIP 2.02.03 - 85	Pile foundation
		Fundatii pe piloti
8.	SNIIP 2.03.11 - 85 * (CP E.04.03-2005)	Protection of structures against corrosion.
		Protectia constructiilor impotriva coroziunii
9.	SNIIP 2.05.02 - 85*	Highways (Design standards)
		Drumuri ( Norme de proiectare)
10.	SNIIP 2.05.03 - 84*	Bridges and culverts (Design standards)
		Poduri si podete (Norme de proiectare)
11.	SNIIP 3.01.01-85*	Organization of building production
		Organizarea productiei de constructie
12.	SNIP 3.01.03-84	Survey and setting out works in construction
		Lucrari topogeodezice in constructie
13.	SNIP 3.01.04-87	Acceptance of completed Works. General provisions.
		Receptia lucrarilor finalizate. Prevederi generale. Hotararea nr.285 In vigoare.
14.	SNIP 3.02.01-87 Replaced by NCMF.01.03.-2009	Performance Rules. Quality Control and Acceptance of Soil Bases and Foundations
		Reguli de executie. Comntrolul calitatii si receptia terenurilor de fundare si fundatiilor
15.	SNIP 3.03.01-87	Bearing and Fencing Structures.
		Elemente portante si de imprejmuire. Este inlocuit capitolul 2 cu NCM F.02.03-2005 "Executarea, controlul calitatii si receptia lucrarilor din beton si beton armat monolit" capitolul 7 este inlocuit cu NCM F.03.03-2004 "Executarea si receptia lucrarilor de zidarie"

16.	SNIIP 3.04.03 - 85	Protection of erected constructions and structures against corrosion
		Protectia edificarilor si constructiilor impotriva coroziunii. C PE.04,03 - 2005
17.	SNIIP 3.05.06-85	Electrical devices
		Dispozitive electrice
18.	SNIIP 3.06.03 - 85	Highways (Construction and acceptance of works. Regulations).
		Drumuri auto(Prescriptii la efectuarea lucrarilor si receptia lor)
19.	SNIIP 3.06.04 - 91	Bridges and culverts (Construction and acceptance of works. Regulations)
		Poduri si podete (Prescriptii la efectuarea lucrarilor si receptia lor)
20.	SNIIP 3.06.07-86	Bridges and culverts. Rules for Inspection and Testing
		Poduri si podete. Regulament pentru inspectari si incercari
21.	SNIIP II-7-81*(for cl.3.35 to 3.51 of SNIIP is applied NCM F.03.02-2005)	Construction in Seismic Regions
		Constructii in zone seismice
22.	SNIIP III-4-80*	Construction safety regulation
		Tehnica securitatii in constructii
23.	SNIIP III -18 - 75	Metal structures
		Constructii metalice
24.	PUE	Electrical code (7 edition)
		Normativ Electric (7 editie)
25.	PTE	The technical operation of electrical installations
		Operatiuni tehnice al instalarii electrice
26.	VSN 8-89	Environmental Protection when constructing, repairing and maintaing the highways. Instructions
		Instructiuni de protectie a mediului la lucrarile de constructie, reparatie si exploatare a drumurilor auto
27.	VSN 24 - 88	Repair and maintenance of highways. Technical standards.
		Normele tehnice pentru reparatia si intretinerea drumurilor auto.
28.	VSN 32 - 81	Waterproofing to bridges and culverts on railways, highways and urban roads. Instruction.
		Instructiuni de executare a hidroizolarii elementelor de poduri si podete pe drumuri auto, strazi si cai ferate.
29.	VSN 37 - 84 (Supliment)	Traffic Management and Security of Road Sectors under Works. Instructions.
		Instructiuni pentru dirijarea circulatiei rutiere si lucrari de drumuri. Norme metodologice privind conditiile de închidere a circulației și instituire a restricțiilor de circulație în vederea executării de lucrari în zona drumului public și/sau protejării drumului sectoarelor in executie
30.	Norme metodologice	Methodological norms regarding the conditions for closing traffic and establishing the traffic restrictions in the execution of works in public road and / or protect the road
		Norme metodologice privind conditiile de inchidere a circulatiei si instituire a restrictiilor de circulatie in vederea executarii de lucrari in zona drumului public si/sau protejarii drumului



31.	VSN 38 - 90	Road pavement works on top of uneven surfaces. Technical standards.
		Normele tehnice pentru executarea imbracamintilor rutiere cu suprafata rugoasa
32.	VSN 81 - 80	Manufacturing and Construction of RC and Concrete Culverts. Instructions
		Instructiuni pentru fabricarea si constructia podetelor din beton si beton armat
33.	VSN 86 - 83	Designing and Mounting of Rubber Bearing Pads. Instructions
		Instructiune pentru proiectarea si asezarea aparatelor de reazem din polimeri la poduri
34.	VSN 139-80	Cement Concrete Pavements. Instructions
		Constructia imbracamintei din beton cu ciment. Instructii
35.	ODN 218.046-01	Designing of Flexible Road Pavement. Instruction.
		Proiectarea imbracamintei rutiere nerigide. Instructii
36.	ENiR, pc E 2 - 1 - 45	Mechanical and Manual Earthworks.
		Lucrari de terasamente mecanizate si manuale
37.	ENiR, pc E 18 - 24	Revegetation
		Lucrari de inverzire
38.	GOST 9.032 - 74*	Lacquer and Paint Coating. Groups, Technical Requirements.
		Acoperirea cu lac si vopsea. Tipuri, conditii tehnice si marcari.
39.	GOST 82-70*	Universal hot-rolled wide strip steel
		Laminarea universala a fisiilor late de otel la temperaturi inalte
40.	GOST 310.1 - 76*	Cements. Test Methods. General provisins.
		Cimenturi. Metode de testare. Prevederi Generale
41.	GOST 310.2 - 76*	Cements. Method for Coarseness Determination.
		Cimenturi. Metode de determinare a finetei de macinarie
42.	GOST 310.3 - 76*	Cements. Methods for Determination of Standard Consistency, of settingtime and of Sound Cement.
		Cimenturi. Metode de determinare a consistentei normale, termenilor de priza si schimbarii uniforme a volumului
43.	GOST 310.4 - 81	Cements. Methods for Determination of bending and compression strength.
		Cimenturi. Metode de determinare a rezistentei la incovoiere si compresiune
44.	GOST 380-94, GOST 380-2005	Ordinary carbon steel. Grades.
		Otel-carbon obisnuit. Marca de otel
45.	GOST 931 - 90	Brass sheets and strips. Technical conditions.
		Table si fasii din cupru. Conditii tehnice
46.	GOST 4245 - 72	Drinking water. Methods for determination of chloride content
		Apa potabila. Metode de determinare a continutului de cloruri
47.	GOST 4389 - 72	Drinking water. Methods for determination of sulphate content
		Apa potabila. Metode de determinare a continutului de sulfati
48.	GOST 5336-80*	Single bar steel grids. Technical Conditions.
		Plase de otel ordinare.
49.	GOST 5781 - 82*	Hot – rolled steel for reinforcement of ferro-concrete structures. Specifications.

		Otel laminat la temperaturi inalte pentru armarea constructiilor din beton armat. Conditii tehnice.
50.	GOST 5802 - 86	Mortars. Test methods. Mortare de constructii. Metode de testare
51.	GOST 6665-91	Concrete and reinforced concrete kerbs. Specifications. Elemente prefabricate din beton si beton armat pentru borduri
52.	GOST 6727-80*	Hard drawh low-carbon steel wire for reinforced concrete. Technical requirements Sirma din otel cu continut jos de carbon intinsa la temperaturi joase. Conditii tehnice
53.	GOST 6713-91	Low-alloyed structural rolled steel for bridge construction. Specifications. Laminarea otelului cu continut jos de carbon pentru constructia podurilor
54.	GOST 7473 - 94	Ready-mixed concrete. Technical Conditions. Amestecuri de beton. Conditii tehnice
55.	GOST 8267 – 93*	Crushed dense aggregates and gravel for construction. Technical Conditions. Piatra concasata din roca densa de munte pentru constructie. Conditii tehnice.
56.	GOST 8269 - 87*	Natural Crushed Stone, Gravel for Construction. Test Methods. Piatra naturala sparta, pietris pentru lucrari in constructie. Metode de testare
57.	GOST 8269.0-97*	Crushed dense aggregates and gravel of natural rock, industrial wastes for construction. Physical-mechanical testing methods. Piatra concasata si prundis din roca densa de munte, resturi de materiale industriale pentru constructie. Metode fizico-mecanice de testare.
58.	SM STB 1538:2009	Artificial bumps on the roads and streets. Technical requirements. Application. Denivelări artificiale pe drumuri și străzi auto. Cerințe tehnice și reguli de aplicare
59.	GOST 8269.1-97	Crushed aggregate and gravel of natural rock, and of production residue for construction works. Chemical analysis testing methods. Piatra concasata si prundis din roca densa de munte, resturi de materiale industriale pentru constructie. Metode de analiza chimica de testare
60.	GOST 8735 – 88*	Sand for construction. Testing methods. Nisip pentru lucrari in constructie. Metode de testare
61.	GOST 8736 -93*	Sand for construction. Technical Conditions. Nisip pentru lucrari in constructie. Conditii tehnice
62.	GOST 9812-74*	Petroleum bitumen. Technical Conditions. Bitumul petrolier de izolare. Conditii tehnice
63.	GOST 9825 -73*	Lacquer-painting materials. Terms, definitions and designation. Materialele din vopsea cu lac. Termeni, definitii, marcare.
64.	GOST 10060.0 - 95	Concrete types. Frost Resistance Test Method. Tipuri de beton. Metode de determinare a rezistentei la inghet-dezghet

65.	GOST 10178 – 85*	Portland cement and Portland blast furnace slag cement. Technical Conditions.
		Ciment portland si ciment portland cu adaos de zgura (Conditii tehnice )
66.	GOST 10180 - 90	Concrete Types. Test Methods for strength of specimens.
		Tipuri de beton. Metode de determinare a rezistentei probelor de control
67.	GOST 10181-2000	Concrete mixtures. Test Methods.
		Amestecuri de beton. Metodele de testare
68.	GOST 10704-91	Longitudinal (electric) welded steel pipes (tubes). Assortment.
		Tevi de otel electric sudate longitudinal. Sortiment
69.	GOST 10807-78* (Modificarea nr .3) Replaced by SM GOST R 52290:2009	Road signs. General technical requirements
		Indicatoare rutiere. Cerinte tehnice generale
70.	GOST 11501 - 78*	Petroleum Bitumen. Penetration Test Method.
		Bitumul petrolier. Metode de determinare a penetratiei
71.	GOST 11503 - 74*	Petroleum Bitumen. Viscosity Test Method.
		Bitumul petrolier. Metode de determinare a viscozitatii
72.	GOST 11955-82*	Cutback Road bitumen. Technical Conditions
		Bitumul lichid pentru drumuri. Conditii tehnice
73.	GOST 12071 - 2000	Soils. Sampling, handling and sample storage.
		Soluri. Selectarea, ambalajul, transportarea si pastrarea probelor.
74.	GOST 12248 - 96	Soils. Laboratory methods for strength and shear strength.
		Soluri. Metode de determinare a rezistentei si rezistentei la deformare
75.	SR EN 1463-1	Products for road marking. Road Studs Produse pentru marcare rutiera. Butoane reflectorizante
76.	GOST 12536 - 79	Soils. Laboratory Grading Analysis Method.
		Soluri. Metode de determinare a compozitiei granulometrice in laborator
77.	GOST 12730.0 -78 to 12730.4-78	Concrete Types. General requirements for density, moisture content, water absorption, porosity and impermeability to water Test Methods.
		Tipuri de beton. Conditii generale pentru metodele de determinare a densitatii, umiditatii, absorbtiei de apa, porozitatii si impermeabilitatii
78.	GOST 12730.5-84*	Concrete Types. Impermeability to water Test Methods.
		Tipuri de beton. Metode de determinare a impermeabilitatii
79.	GOST 13508 - 74*	Road Marking
		Marcaj rutier
80.	GOST 14098-91	Welded joints of reinforcement and of embedded elements of reinforced-concrete constructions. Types, structure and dimensions.
		Sudarea armaturii si a pieselor inglobate pentru constructiile de beton armat. Tipuri, structura si dimensiuni
81.	GOST 15836 -79	Bituminous rubber insulating mastic. Technical conditions

		Mastic bituminos cu cauciuc izolant. Conditii tehnice
82.	GOST 16557 - 78	Filler for asphaltic-concrete mixtures. Technical requirements Filer pentru beton asfaltic (Conditii tehnice)
83.	GOST 18105 - 86*	Concrete Types. Strength Test Methods. Tipuri de beton. Reguli de control a rezistentei betonului
84.	GOST 18164 -72	Drinking water. Test Method for Solid Residue Content. Apa potabila. Metoda de determinare a continutului de rezidii solide
85.	GOST 18599-2001*	Polythene pressure pipes. Specifications Tevi de presiune din polietilen. Conditii tehnice.
86.	GOST 18659 - 81	Road Bitumen Emulsions. Technical requirements. Emulsii bituminoase pentru drumuri. Conditii tehnice
87.	GOST 20522 - 96	Soils. Statistical processing method of test results. Soluri. Metoda statica de prelucrare a rezultatelor testarilor
88.	GOST 22245 -90*	Viscous Road Petroleum Bitumen. Specifications Bitumul viscos pentru drumuri. Conditii tehnice
89.	GOST 22733 - 2002	Soils. Laboratory method for maximum density Soluri. Metode de laborator de determinare a densitatii maxime
90.	GOST 23279 - 85	Welded reinforcement grids for precast reinforced concrete structures and units. General Technical Conditions. Plase sudate metalice pentru constructii si articole din beton armat. Conditii generale tehnice
91.	GOST 23457-86* Replaced by GOST R 52289-2004 SM GOSTR 52289:2009	Traffic control equipment: road signs, marking, traffic lights, parapets and guiding devices. Application. Mijloace tehnice de dirijare a circulatiei rutiere: indicatoare rutiere, marcajul, semafoare, parapete, dispozitive de orientare. Reguli de aplicare.
92.	SM STB 1033 -2008	Asphalt concrete mixtures for road and aerodromes and asphaltic concrete. Specifications. Amestecuri de beton asfaltic pentru drumuri si aerodromuri si beton asfaltic. Conditii tehnice
93.	SM STB 1062-2008	Oil bitumens for road pavement wearing course. Specifications. Bitumiri de petrol pentru stratul superior al imbracamintei rutiere. Conditii tehnice.
94.	SM STB 1115 - 2008	Asphalt concrete mixtures for road and aerodromes and asphalt concrete. Methods of testing. Amestecuri de beton asfaltic pentru drumuri si aerodromuri si beton asfaltic. Metode de incercari.
95.	SM STB 1220 - 2008	Modified road bitumens. Specifications. Bitumiri rutiere modificate. Conditii tehnice.
96.	SM STB 1311 - 2008	Cubical crushed stone from dense mountain breeds. Specifications. Piatra sparta de forma cubica din roci de munti tari. Conditii tehnice.
97.	GOST 23558 – 94*	Crushed stone-gravel-sand mixtures and soils, treated by inorganic binder for road and aerodrome construction. Specifications

		Amestecuri de piatra concasata – prundis-nisip si soluri, prelucrate cu lianti anorganici pentru constructia drumurilor si aerodromurilor. Conditii tehnice
98.	GOST 23732 - 79	Water for concrete and mortar. Specifications. Apa pentru beton si mortar. Conditii tehnice
99.	GOST 24143 - 80	Soils. Laboratory methods for swelling and subsidence Soluri. Metode de determinare a caracteristicilor la umflare si tasare
100.	GOST 25192 – 82*	Classification of Concrete and general technical requirements. Clasificarea betonului. Conditii tehnice generale.
101.	GOST 25328 - 82	Building mortar cement. Specifications. Ciment pentru mortare de constructii. Conditii tehnice
102.	GOST 25584 – 90*	Soils. Laboratory method for permeability coefficient. Soluri. Metode de determinare a coeficientului de filtratie in laborator
103.	GOST25607 – 2009 SM GOST 25607:2010	Crushed stone-gravel-sandy mixtures for road and aerodrome base and pavement. Specifications Amestecuri de piatra concasata - prundis - nisip pentru sisteme rutiere si aerodromurilor. Conditii tehnice
104.	GOST 26633 – 91*	Heavy-weight and sand concretes. Specifications Beton greu cu granulatie fina (Conditii tehnice)
105.	GOST 26804 -86	Metal road safety barriers. Specifications Parapeti metalici de siguranta. Conditii tehnice.
106.	GOST 28013 – 98*	Mortar Types. General Technical Conditions. Mortare de constructie. Conditii tehnice generale
107.	GOST 30055-93*	Ropes of polymeric materials and combined ropes. Specifications Odgoane din materiale polimerice si odgoane combinate. Conditii tehnice
108.	GOST R 51256-99 SM GOST R 51256:2009	Road marking. Types and basic parameters. General technical requirements. Marcajul rutier. Tipuri si parametri de baza. Conditii tehnice generale
109.	SM GOST R 52289:2009 SE REPETA 89	Traffic control equipment: road signs, marking, traffic lights, parapets and guiding devices. Application. Mijloace tehnice de dirijare a circulatiei rutiere: indicatoare rutiere, marcajul, semafoare, parapete, dispozitive de orientare. Reguli de aplicare.
110.	GOST 9238-83	Construction and rolling stock clearance diagrams for the railways of 1521 (1524) mm gauge Gabarit de apropiere a constructiilor si a garniturilor de tren pentru caile ferate cu calea de 1521(1524)
111.	SM GOST P 50597-2009	Highways and streets. The requirements for the level of maintenance, admissible under the terms of road traffic safety on the territory of Russian Federation SM GOST R 50597:2009 applied in Moldova Drumuri și străzi auto. Cerințe pentru starea de exploatare, admisibilă conform condițiilor de asigurare a securității traficului rutier pe teritoriul Republicii Moldova

112.	GOST 26804-86	Road metallic barriers. Technical requirements
		Parapet metalic pentru drumuri de tip bariera. Conditii tehnice
113.	GOST P 52607-2006	Technical means for road traffic management. Road crash barriers for vehicles. General technical requirements
		Mijloace tehnice pentru organizarea traficului rutier. Parapete de siguranță laterale pentru vehicule. Cerințe tehnice generale
114.	GOST 25458-82	Wooden (timber) posts for road signs. Specifications
		Stâlpi de lemn pentru montarea indicatoarelor rutiere. Specificații tehnice
115.	GOST 25459-82	R/C posts for road signs. Specifications.
		Marcaje rutiere. Tipuri și parametri de bază. Cerințe tehnice generale pe teritoriul Moldovei
116.	SM GOST R 52575:2001 GOST R 52766-2007	Materials for Road Marking. Furniture Elements, General requirements
		Materiale pentru marcajul rutier Accesorii. Cerinte generale
117.	GOST 6665-91	Concrete and R/C kerbs. Specifications.
		Piloni din beton armat pentru montarea indicatoarelor rutiere. Specificații tehnice
118.	SM GOST R 51256:2009	Road marking. Types and main characteristics. General technical requirements on the territory of RF applied in Moldova
		Marcaje rutiere. Tipuri și parametri de bază. Cerințe tehnice generale pe teritoriul Moldovei
119.	SM GOST R 50970:2009	Road marker posts. General technical requirements. Rules of application
		Borne de dirijare a circulației rutiere. Cerințe tehnice generale. Reguli de aplicare pe teritoriul Moldovei
120.	SM GOST R 50971:2009	Traffic control devices. Road reflectors. General technical requirements. Rules of application
		Reflectoare de lumină pentru circulația rutieră. Cerințe tehnice generale. Reguli de aplicare pe teritoriul Moldovei
121.	SM GOST R 52290:2009 GOST R 52290:2004	Road signs. General technical requirements. Replaced by GOST P 52290-2004 on the territory of RF; SM GOST R 52290:2009 applied in Moldova
		Indicatoare rutiere. Condiții tehnice generale. Înlocuit cu SM GOST R 52290:2009 pe teritoriul Moldovei
122.	GOST 30412-96	Highways and aerodromes. Measurement methods of base course and pavement roughness (unevenness).
		Drumuri auto și aerodromuri. Metode de măsurare a rugozității ale fundațiilor și suprafețelor
123.	GOST 17.5.3.06-85	Nature protection. Lands. Standard removal requirements for the topsoil layer during earthworks
		Protecția naturii. Soluri. Cerințele de determinarea normelor de înlăturare a staturilor fertile de sol în timpul lucrărilor de construcție
124.	GOST 20444-85	Noise. Traffic flows. Measurement methods of noise characteristics
		Zgomotul. Fluxul de transport. Metode de măsurare a caracteristicilor de zgomot

125.	GOST 27408-87	Noise. Methods of statistical processing of data in determination and control of noise caused by vehicles
		Zgomotul. Metode statistice de prelucrare a rezultatelor determinării și controlului nivelului de zgomot, produs de mijloacele tehnice
126.	GOST 27436-87	External noise of motorized vehicles. Permissible level and methods of measurements
		Zgomotul exterior produs de mijloacele tehnice auto. Nivelul admisibil și metode de măsurare
127.	SP MD 93-16-001-95 STANDARD PROFESIONAL	Roadways. Kilometer posts Lucrari de drumuri. Indicatoare kilometrice
128.	GOST 12801-98	Processed material with organic binders for road construction and aerodromes. Testing methods.
		Materile prelucrate cu lianti organici pentru constructia drumurilor si aerodromuri. Metode de incercare.
129.	GOST 103-2006	Hot-rolled steel strips. Dimensions
		Platbanda din otel laminat la cald. Sortiment
130.	GOST 2591-88 Replaced by GOST 2591-2006	Square hot-rolled Steel Bars Dimensions
		Bare din otel cu sectiune patrata laminate la cald. Sortiment
131.	GOST 5264-80*	Manual welding. Welding joints. Main types, design elements and dimensions
		Sudura de mana. Conexiuni sudate. Tipuri de baza, elemente constructive
132.	GOST 5915-70*	Hexagon nuts, product grade B. Construction and dimensions
		Piulite hexagonale cu clasa de precizie B. Structura si dimensionarea
133.	GOST 8239-89	Steel hot-rolled I-beams
		Grinzi dublu T din otel laminat la cald
134.	GOST 8509-93	Hot-rolled steel equal-leg angles. Dimensions
		Corniere din otel cu aripi egale laminate la cald. Sortiment
135.	GOST 8639-82*	Square steel pipes. Assortment
		Tevi din otel cu sectiune patrata. Sortiment
136.	GOST 8734-75*	Seamless cold-deformed steel pipes. Range of sizes
		Tevi din otel deformabile la rece. Sortiment
137.	GOST 9128-2009 SMSTB 1033:2008	Asphaltic concrete Mixtures for roads and aerodromes and asphaltic concrete. Specifications
		Amestecuri din asfalt si beton asfaltic pentru drumuri si aerodromuri. Conditii tehnice
138.	GOST 9467-75*	Metal covered electrodes for manual arc welding of structural and heat-resistant steels. Types
		Electrozi din otel cu acoperire pentru sudarea manuala cu arc electric a otelurilor de constructie si rezistente la temperatura. Tipuri
139.	GOST 10587-93	Uncured epoxy resins. Specifications
		Rasini epoxidice neintarite
140.	GOST 10923-93*	Ruberoid. Technical requirements
		Ruberoid. Conditii tehnice

141.	GOST 11371-78*	Washers. Technical requirements
		Saibe. Conditii tehnice
142.	GOST 28012-89	Demountable travelling stage. Specifications
		Schele mobile si demontabile. Conditii tehnice
143.	GOST 28570-90	Concretes. Strength evaluation methods by means of sampling
		Betoane. Metodele de determinare a rezistentei betonului prin testarea carotelor prelevate din constructii
144.	GOST 30547-97	Roofing and hydraulic insulating materials in rolls General specifications
		Materiale de acoperis si hidroizolare in rulouri. Conditii tehnice generale
145.	GOST 8240-97	Hot-rolled steel channels. Assortment
		Otel cu profil U laminat la cald. Sortiment
146.	GOST 6713-91	Low-alloyed structural rolled stock for bridge building. Specifications
		Laminat de constructii cu aliere scazuta pentru constructii de poduri. Conditii tehnice
147.	OST 35 - 27.0 - 85	Reinforced concrete units for box and pipe culverts for railway and road culverts. Specifications
		Elemente din beton armat pentru podete tubulare si podete cadru la caile ferate si drumuri auto. Conditii tehnice
148.	OST 35 - 27.2 - 85	Reinforced concrete units for rectangular drainage pipes for railway and road culverts. Structure and dimensions.
		Elemente din beton armat pentru podete cadru folosite la drumuri auto si cai ferate. Constructia si dimensiunile
149.	ODMD 27.06.2002	Recommendations for rehabilitation of the roads with flexible pavement at cold recycling.
		Recomandari pentru reabilitare drumurilor cu imbracaminti suple cu ajutorul reciclarii la rece.
150.	ODMD 1991	"Method Statements on the construction of base and pavement layers of vibrated cementconcrete" SOIUZDORNII/Moscow 1991
		"Metode de constructie a straturilor de baza si a imbracamintei rutiere sin beton de ciment vibrat" SOIUZDORNII/Moscova 1992
151.	TU 1-51-75	Waterproofing layer
		Strat izolant
152.	TU 400-1/55-16-76	Waterproofing layer
		Strat izolant
153.	TU 2539-008-00149334-2003	Neoprene bearings
		Ghid de proiectare si instalare a aparatelor de raezem din neopr n pentru poduri
154.	TU 5210-001-25432924-2008	Road metallic barriers. Specifications
		Parapet metalic pentru drumuri de tip bariera. Conditii tehnice
155.	TU 14-4-1731-2007	Fired pin for assembly
		Dibluri-cuie pentru montare
156.	Standard design 503.09-7.84	Drainage structures for roads
		Constructii pentru evacuarea apelor de pe drumuri auto
157.	Standard design	R/C piles of rectangular shape and solid sectiuon for bridge piers



	series 3.500.1-1.93	Piloti din beton armat dintr-o bucata cu sectiune plina dreptunghiulara pentru pile de poduri
		Pile unificate pentru poduri de cale ferata cu utilizarea elementelor prefabricate. Editia 0-2. Pile cu stalpi. Materiale pentru proiectare
158.	Standard design Series 3.501.1-156	Slope consolidation with concrete
		Protejarea albiilor si taluzelor la poduri mici si mijlocii, si la podete
159.	Standard design Series 3.503-29	Slab bridges of 6.0 and 9.0 m spans on pile bent piers and abutments
		Poduri dalate prefabricate din beton armat cu deschideri de 6,0 si 9,0 m pe pile din piloti
160.	Standard design Series 3.503-41	Bridge and overpasses approaches
		Racordarea podurilor si pasajelor de sosea cu terasamentul rampei de acces
161.	Standard Design Series 3.503.1-66	Reinforced concrete precast elements for drainage from roads
		Elemente prefabricate din beton armat pentru sisteme de evacuare a apei de pe drumurile auto
162.	Standard design Series 3.503.1-75	Road Bridges of Precast RC elements with spans of 6 and 9m on piles
		Poduri de sosea din elemente prefabricate din beton armat cu deschideri de 6.0 si 9.0 m pe infrastructuri din piloti
163.	Standard design Series 3.503.1-79	Reinforced concrete piles for road bridge infrastructure with a span up to 24.m
		Infrastructuri cu piloti din beton armat pentru poduri de sosea cu deschideri de pana la 24.0 m
164.	Standard design Series 3.503.1-81	Precast Reinforced Concrete I-Type beam bridge and overpass decks with spans of 12. 15. 18. 21. 24 and 33m length.
		Suprastructuri pe grinzi cu sectiunea dublu T prefabricate din beton armat cu pretensionare de 12.0 , 15.0 , 18.0 , 21.0 , 24.0 si 33.00 m lungime pentru poduri si pasaje de sosea amplasate pe drumuri publice, strazi si drumur in orase
165.	Standard design Series 3.503.1-96	Approaches to the bridges and overpass
		Racordarea podurilor si pasajelor de sosea cu terasamentul
166.	Standard design Series 3.503.1-101	Waterproofing to carriageway, coverage of the expansion joints of precast reinforced concrete road bridge and overpass decks of 33m length.
		Hidroizolatia partii carosabile, acoperirea rosturilor de dilatare a suprastructurilor din beton armat cu lungimea de pana la 33.00 m pentru poduri si pasaje de sosea
167.	Standard design Series 3.503.1-96	Approaches to the bridges and overpass
		Racordarea podurilor si pasajelor de sosea cu terasamentul
168.	Standard design Series 3.503.1-101	Waterproofing to carriageway, coverage of the expansion joints of precast reinforced concrete road bridge and overpass decks of 33m length.
		Hidroizolatia partii carosabile, acoperirea rosturilor de dilatare a suprastructurilor din beton armat cu lungimea de pana la 33.00 m pentru poduri si pasaje de sosea

## **2. *Engineer's Offices***

Engineer's offices specified in Chapter 004 shall consist of:

<b>ITEM</b>	<b>CONTRACT OFFICE</b>	<b>LABORATORY OFFICE</b>
Office 1	20 s q. m.	
Office 2	15 sq. m.	15 sq. m.
Office 3	15 sq. m.	
Office 4	15 sq. m.	
Conference Room	30 sq. m.	
Toilet Room with		
Flush toilet cubicles	3 no	1 no
Wash hand basin	2 no	1 no
Shower		1 no
Kitchenette	10 sq. m.	5 sq. m.
Store room	10 sq. m.	5. sq. m.
Car parking space		
Covered area for cars	4 cars	2 cars

Note that the Laboratory accommodation (including covered car parking) is for the exclusive use of the Engineer. The Contractor must allow for such additional space as he requires for his own staff.

### 3. *Furniture and Equipment for Engineer's Offices*

The following list is indicative of the items required

ITEM	CONTRACT OFFICE	LABORATORY OFFICE
Through-the -wall air conditioning/heating units	5	1
Desks with four lockable drawers (1.8m x 0.9m)	4	1
Padded, high back swivel chairs	4	1
Table (1.8m x 0.9m )	2	
Chairs with padded seats	12	3
Meeting room table (2.6m x 1.6m)	1	
Meeting room chairs	12	
Drawing board with parallel motion	1	
Drawing stools	1	
Plan chest – 8 drawers	1	
Drawing rack with suspension arms	1	
Filing cabinets with file suspension system ( 4 draws )	2	
Shelf units (stack of 5, 1.8m x 0.3m )	6	1
Cupboards ( 1.7m x 0.9m x 0.3m ) with 3 shelves and lock	2	
Telephone system with 5 extensions	1	
Single Telephone Installation		1
Internet access points	4	1
Crockery and cutlery	For 15 people	For 6 people
Electric kettle 1 litre	1	1
Electric kettle 2 litre	1	
Coffee maker 1 litre	1	1
Saucepans	2	2
Clothes stand	3	1
Refrigerator ( 150 Litres )	1	
Refrigerator (50 Litres )	1	1

# **1. PREPARATORY WORKS**

## ***CHAPTER 101. SITE PREPARATION***

### **101.01. Introduction**

The chapter describes the surveying and setting out required to be carried out by the Contractor for the purposes of executing the Works.

### **101.02. General**

The Contractor is required to carry out all survey works required for the execution of the Works. Basic data in respect of key setting out points and levels will be provided by the Engineer. All further setting out is the responsibility of the Contractor.

### **101.03. Works description**

#### **Surveying and Setting Out**

The surveying and setting out works will be done according to SNiP 3.01.03-84.

At the commencement of the Works the Contractor shall immediately undertake a complete resurvey of the works using, and at the same time verifying, the base data provided by the Engineer. Any suspected error or discrepancy in the base data must be reported immediately to the Engineer who will make whatever corrections may be required and inform the Contractor. This work must be carried out well in advance of the permanent works. No claim for delay or extra cost, other than changes in cost arising from consequent changes in quantities, will be entertained as a result of errors in the base data, although Sub-Clause 1.9 [Delayed Drawings or Instructions] of the Conditions of Contract remains in full force and affect.

The Contractor will establish clear centre line references and benchmarks at intervals of not more than 250 metres throughout the length of the project together with additional centreline references for all curve and curve start and end points, curve midpoints and, if appropriate, tangent intersection points (IPs).

The complete list of centreline references and benchmark values shall be submitted to the Engineer who shall carry out such checks as he may deem fit and shall approve the list which shall then become the basis for the line and level control of the Works. Notwithstanding the approval of the Engineer, the Contractor remains wholly responsible for the completeness and accuracy of the above list and for the continued preservation of all references and benchmarks until the completion of the Works.

#### **Construction Drawings**

A comprehensive condition survey of all of the existing elements of the highway shall be jointly carried out by the Engineer, the Designer's Representative and the Contractor. The Contractor shall prepare strip plans to clearly differentiate between defects, if any, included for by the designs and requirement, if any, for additional works.

The Contractor shall prepare Draft Construction Drawings in accordance with Subsection 006.02 based upon and in fulfillment of the intentions of the design implicit in the contract drawings, including any necessary corrections for identified defects, in sufficient detail to

allow the works to be constructed and measured accordingly and to minimise the estimated Cost of the works to be executed.

During the preparation of the the Draft Construction Drawings the Contractor shall implement the design safety improvement recommendations of the Road Safety Audit, carried out by the Employer on the Tender Design Drawings. The approved design safety improvements and further agreed necessary traffic calming measures shall be incorporated into the construction drawings.

The Contractor shall submit his Proposal for construction (in accordance with the Draft Construction Drawings and Road Safety Audit), with a detailed quantity and cost analysis and a programme for execution within the Time for Completion.

The Designer's Representative shall Review and agree, or provide comments upon, the conformity of the Draft Construction Drawings with the intentions of the Design and verify the Contractor's quantity and cost analysis.

The Engineer shall review the conformity of the Contractor's Proposal together with the review of the Designer's Representative, require corrections as necessary and, when he determines the Proposal to be technically and financially acceptable, forward the submission to the Employer for approval as a Variation, as may be necessary, and (subject to the approval of the Employer), issue the Variation to the Contractor as 'Approved for Construction'.

Following the completion of the review/approval process the Contractor shall prepare the Final Construction Drawings.

#### **101.04. Works Acceptance**

##### **Measurements**

- The surveying and setting out works will be measured in kilometres or parts of a kilometre.

##### **Payment**

###### Surveying and Setting Out

The works measured as indicated above and confirmed by the Engineer will be paid according to the unit price per kilometre provided in the contract.

Payment for the work of survey and setting out shall be made in accordance with the progress of the work.

30% of the cost shall be payable on acceptance by the Engineer of the list of references and benchmarks

50% shall be payable on acceptance of the milling and regulating and/or the construction of new pavement to top of crushed base by the Engineer as ready for laying of asphalt paving courses.

20% shall be payable on completion and acceptance of the finished wearing course.

###### Construction and Record Drawings

The costs and expense of preparing Construction and Record Drawings prepared by the Contractor and accepted by the Engineer shall be included in the rates and prices entered by the Contractor in the Bills of Quantities.

The payment shall be made under the following item:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
10101	Surveying and setting out works	Kilometre

## **CHAPTER 102. SITE CLEARANCE**

### **102.01. Introduction**

This chapter deals with site clearing, the removal of topsoil and the removal of trees, roots and stumps.

### **102.02. Generalities**

Wherever the Works require terrain clearing, including removal of shrubs and bushes, removal of topsoil, and the removal of trees, having a diameter exceeding 200mm at a height of 1 metre above the ground, such works shall be executed under this Chapter. Topsoil shall be removed at locations and to a depth to be indicated by the Engineer.

Roots and stumps shall be removed to a depth of at least 1 metre below finished ground or subgrade level.

Topsoil shall be set aside in areas selected by the Contractor and approved by the Engineer for reuse in soiling areas of cut and embankment slopes. It shall be carefully preserved and shall not be mixed with other material. The material must not contain harmful impurities, hard particles, clay, garbage, stones etc, and shall be used according to SNiP 3.06.03-85 and SNiP 2.05.02-85.

Trees will be removed only where specifically directed by the Engineer. Where trees are removed the roots and stumps will be extracted to a depth of at least 1.00 m below finished ground level or below subgrade level as appropriate. The holes will be filled and compacted, in layers not greater than 20cm, in accordance with the requirements of Chapter 203.

Trees, roots, bush and other matter unsuitable for reuse shall be burnt or otherwise disposed of in a manner acceptable to the local authorities and to the Engineer. Burning shall be in accordance with the requirements of Chapter 103 below.

### **102.03. Works acceptance**

The works acceptance will verify that the above described works have been done in accordance with the drawings and technical specifications, and in a manner approved by the Engineer.

#### **Measurement**

The works for terrain clearing, removal of topsoil, tree clearance and root extraction will be measured in hectar (ha) or cubic meters of topsoil removed and stored for reuse or number as appropriate.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid according to the unit price provided in the Contract. The payment made under this item

shall be the full and complete payment for the completed works indicated in the present chapter.

Payment will be made under the following item:

No.	Item	Unit of Measure
10201	Site Clearance including brush, underground and vegetation	Hectare
10202	Removal of topsoil - stripping, loaded, transported and stockpiled for re-use	Cubic Metre
10203	Tree clearance and disposal	Number

## **CHAPTER 103. DEMOLITION**

### **103.01. Introduction**

This chapter deals with the removal of traffic signs, service poles, fences, kerbs, guard rails, kilometre posts and such like items and their storage for future use and/or their burning or disposal by other means.

### **103.02. Backfill Materials**

Where backfill materials are required they shall be used in accordance with the provisions of Chapter 203.07.

### **103.03. The use of materials**

Where directed by the Engineer all recoverable materials will be saved. Recoverable items shall be salvaged in readily transportable sections or pieces.

Recovered items shall either be for reuse in the Works or for reuse by the Employer. The Engineer will indicate which item or group of items will be subject to reuse. In the event that items are for reuse by the Employer the Contractor shall deliver them to a yard or storage area indicated by the Engineer. Items for reuse will generally comprise signs, including posts and all fittings, and guardrails.

All reusable items for the Works are to be carefully stored on site by the Contractor who shall repair or change all sign and guard rail components and fixing systems, lost or damaged.

### **103.04. Removing Material**

Concrete or stone kerb shall be removed entirely, including any backing concrete and shall be disposed at landfill sites agreed with the local authorities and approved by the Engineer.

After the removal of poles or posts all holes will be filled and compacted, in layers not greater than 20 cm, in accordance with the requirements of Chapter 203.

All filling material will be compacted using a mechanical or vibratory compactor.

### **103.05. Disposal of materials**

The disposal of materials indicated for disposal will be made as follows:

#### **a) Transportation off-site**

The contractor will be responsible for the transportation of waste materials to disposal areas/landfill sites agreed with the authorities having jurisdiction where materials will be disposed of in accordance with the local by-laws and the requirements of the specification.

One copy of all documentation providing the agreement with the authority having jurisdiction for the use of such site(s) shall be given to the Engineer. No such disposal/landfill sites shall be used without the approval of the Engineer.

#### **b) Burning of Debris**

Burnable materials that are to not to be reused may be disposed of by burning. The Contractor shall obtain the approval of the authorities having jurisdiction for disposal by burning before any action is taken. A copy of the document approving both the burning process and the site at which it is to be carried out shall be submitted to the Engineer for his agreement before any burning is carried out. No items shall be burnt without the express approval of the Engineer.

When the burning process is finished the fire will be extinguished. All materials remaining, ash or incompletely burned items shall be removed and disposed of in accordance with the provisions of paragraph (a) above.

### **103.06. Works acceptance**

The works acceptance will verify that the above described works have been done in accordance with the drawings and technical specifications, and in accordance with Sub-Clause 001.02 and in a manner approved by the Engineer.

#### **Measurement**

The movement of the traffic signs, poles, marker posts, kilometre posts, and such like will be measured by number and the removal of guard rail and kerb by linear metre. Measurement under these items will include all ancillary works including backfilling holes and removal and disposal of debris.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
10301	Traffic signs removal and deliver to Employer	Number
10303	Remove marker posts and dispose	Number



10304	Remove cable type Guard Rail and deliver to Employer	Linear metre
10305	Remove steel W-beam type guard rail and deliver to Employer	Linear metre
10306	Removal of concrete kerb and dispose	Linear metre
10307	Removal of kilometre posts and dispose	Number
10308	Demolition of the concrete lined ditch	Cubic metre

## ***CHAPTER 104. NOT USED***

## ***CHAPTER 105. TEMPORARY ROADS AND SIGNING***

### **105.01. Introduction**

This Chapter deals with the construction and removal of temporary diversion roads at new structures or road works, together with assembly and dismantling of temporary traffic direction signs required for the security of traffic whilst works are in progress.

The traffic control installations on temporary roads or carriageway diversions required for working shall be in accordance with VSN 37-84 and GOST 23457-86. Temporary sign installation shall be made in accordance with the requirements of these specifications and the drawings.

### **105.02. Materials**

Materials for temporary signs shall comply with the following requirements

- Dimensions of traffic signs for the construction period: SM GOST 10807-78
- Reflective foils: appendix 3 to SM GOST 10807-78
- Signposts made of reinforced concrete: SM GOST 25459-82

### **105.03. Generalities**

Directing and diverting traffic, and separation of the working area shall be carried out in accordance with the requirements of chapter 007 [Traffic Management] and of the traffic regulations in VSN 37-84.

During the working period the following requirements shall be observed:

- a) The positioning of signposts, barriers, cones and other marking devices will be proposed by the Contractor and approved by the Engineer before the work starts.
- b) Signs, diversions, barriers and other markings shall be limited to those required for the works actually in progress.

- c) The location of temporary signposts, diversions, barriers and other markings will be changed as needed.
- d) The signs, diversions, barriers and other markings which are not required for the current stage of work will be dismantled or covered.
- e) The Contractor will repair or replace any damaged or defective signs, diversions, barriers and other markings at his own cost immediately upon receipt of a request from the Engineer to rectify them.
- f) All sign installations will be kept clean.
- h) The reflective foils on signs, cones and barriers will be changed or replaced as necessary or as directed in case of deterioration.
- i) All temporary traffic signs, diversions, barriers and other markings shall be dismantled and removed after finishing the works.

#### **105.04. Barriers**

Barriers shall be erected in accordance with Sub-Clause 105.03. Barriers may be of metal, wood or plastic and shall be erected wherever traffic is required to be diverted from its normal location on the road. They shall be used in conjunction with cones to separate traffic moving in opposite directions and to separate work areas from moving traffic.

#### **105.05. Cones**

Cones shall be erected in accordance with Sub-Clause 105.03 and shall be used in conjunction with barriers for the purposes stated in Sub-Clause 105.04 above.

#### **105.06. Temporary signs**

All temporary signs for traffic organization will be formed using approved reflective material. The signs used will be made of wood, metal, or other approved material.

#### **105.07. Flagmen and traffic lights**

Where flagmen are used for directing traffic they shall be adequately trained and shall be equipped with reflective protective clothing (vests), distinctive flags and/or batons. Where traffic lights are provided, if they are under automatic control the sequence of operations shall be carefully programmed to provide intervals suitable for the traffic density and distance between lights.

#### **105.08. Provision of Diversion Roads**

Where it is not possible or, in the Contractor's view less economical, to maintain the traffic on part of the existing paved road, the Contractor shall construct diversion roads. Every effort shall be made to accommodate such diversions within the existing right of way. If this is not possible, any area of land required shall be acquired or leased by the Contractor from the adjacent landowners/proprietors. The Contractor shall be entirely

responsible for the provision of any land required for diversions and shall ensure that any such land is returned to its original condition as soon as the works which necessitated the diversion are complete.

#### **105.09. Construction of Diversion Roads**

For each diversion road, the Contractor shall prepare a design and Traffic Management Plan which shall be submitted to the Engineer for approval. The required width of the diversion shall be instructed by the Engineer. In no case shall diversion roads comprise less than 2 lanes, unless this is not otherwise practical and expressly approved by the Engineer, each of 2.8 metres in width. Diversion roads construction shall be, as a minimum, 200mm subbase, 150 mm base, 50mm asphalt concrete, all constructed on a thoroughly compacted subgrade having a CBR not less than 6% for a depth of 300mm.

Diversion roads shall only be eligible for payment when constructed at locations where the Engineer is satisfied that maintenance of traffic on the existing pavement during the works is impossible. Such circumstances will only be considered where the works to be executed involve the raising of the existing road on embankment or the construction or heavy reconstruction of a bridge or major drainage structure. The need to reconstruct the full width of the road or to apply waterproofing or carry out individual beam replacement to a bridge deck will not be a cause for provision of paid diversion roads and such works must be executed in half widths whilst maintaining traffic on the other half. Locations where diversion roads are accepted as being necessary are indicated on the drawings.

Where diversion roads are required in respect of bridgeworks or in other cases where provision must be made for water to pass under the diversion, the Contractor shall design the necessary structure and shall provide necessary hydrological calculations to demonstrate that the proposed temporary waterway is adequate. Notwithstanding the Engineer's approval of a diversion road, the Contractor shall be entirely responsible for the adequacy of the design and shall accept full responsibility for maintenance of traffic over the diversion at all times.

Before construction of any diversion road, preparatory works shall be executed in accordance with chapters 101, 102, 103.

The Contractor shall divert traffic onto diversion roads under the provisions of this chapter and shall ensure that diverted traffic is completely separated from the area of the Works. After finishing the works, the diversion road is to be removed and the terrain restored to its original condition.

The Contractor shall maintain all diversion roads in a satisfactory condition, free from ruts potholes, standing water or any other inconvenience to traffic, complete with all approved signing and lighting, from the time when they are opened to traffic until such time as they are no longer required.

All materials resulting from the clearance of diversion roads shall be removed from the site and disposed of in accordance with the requirements of Sub-Clause 103.05 unless the Engineer gives permission for their reuse in the Works. Materials arising from the clearance of diversion roads shall not be used in any layer of new pavement other than as subbase or improved subgrade and then only with the approval of the Engineer.

#### **105.10. Illumination of Signs**

All key signs, as indicated by the Engineer, shall be illuminated at night.

### **105.11. Barriers, cones, temporary signs**

The Contractor shall locate, operate, maintain and remove after finishing the works, or at Engineer's order, remove all the barriers, cones, markings, signs, lights and such like concerning traffic control and diversion. During the progress of the Works, the Contractor shall change the position of these control items as required. Barriers shall have amber warning lights if instructed and such shall be located correctly so as to be clearly visible.

### **105.12. Operation of Temporary Installations**

The operation of the temporary installation, executed according to the Contract, will include the maintenance of the reflective surfaces of signs, cones and barriers.

### **105.13. Acceptance**

The execution of the temporary roads and traffic directing installations will be accepted only when the work is done according to the drawings and the specifications and has been approved by the Engineer.

#### **Measurements**

Measurement of the works required for the provision of authorised diversion roads will be made in linear metres of diversion authorised to be constructed.

No separate payment will be made for temporary traffic signs, barriers or any other measures for traffic required for the temporary roads or for traffic diversions or for one-way traffic systems required for the Works. All such traffic management provisions are deemed to be included in the payment described in Chapter 007 or in the payment for diversion roads described below.

#### **Payment**

The provision of approved, authorised diversion roads for the execution of road or bridge works will be paid by the linear metre of diversion road provided at the rate or price per metre in the Bill of Quantities. Payment will be made only for those locations and lengths of diversion road that are specifically indicated in the Drawings. Any other diversion road which the Contractor decides to construct shall be entirely at his own cost.

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
10501	Provide diversion road	Linear Metre

Payment for diversion roads will be in three parts:

40% of the amount will be paid upon completion of the diversion road.

40% of the amount will be paid in equal monthly instalments over the anticipated period in which the diversion will be in use. The Contractor shall advise the Engineer of such anticipated period with his submittal of his Traffic Management Plan. If it becomes apparent to the Engineer that the period of use will be longer than informed he shall reduce the payments accordingly such that payment is equally distributed over the extended period. No payment shall be made for any month in which the Contractor fails to maintain the diversion in accordance with the requirements of the Specification and the total amount payable in respect of the diversion shall be reduced accordingly.

20% of the amount will be paid when the diversion has been removed and the terrain returned to its original condition.

## **2. EARTHWORKS**

### ***CHAPTER 201. THE EXECUTION OF THE EARTHWORKS***

#### **201.01. Introduction**

This chapter deals with the procuring, furnishing, and placing of materials for earthworks including the excavation, storage (stockpiling), transporting the material for preparing, processing, shaping, watering, mixing, levelling and compacting the earthworks to its specified densities and to its finished grade and level.

#### **201.02. Earthworks**

Earthworks consist of the following

##### **a) Excavation**

Excavation along the length of the road to the full construction profile, excluding the removal of the topsoil which is stored and reused and which is described in chapter 102 and 203. Excavation includes the excavation, forming and enlargement of roadside drains.

##### **b) The operation of borrow pits**

If the volume of suitable material arising from the works of excavation is insufficient to meet the requirements for construction of embankments, additional material shall be provided from borrow pits.

##### **c) Stockpiling of suitable material**

Under some circumstances during the rectification of slip areas it will be impossible for the Contractor to reuse material immediately in the embankment. In these cases material shall be stored and reused at a later date.

##### **d) Embankment construction**

The embankments will be executed according to SNiP 2.05.02-85, SNiP 3.02.01-87, SNiP 3.06.03-85

#### **201.03. Material**

The material shall comply with SNiP 2.05.02-85.

The materials for the embankment construction shall be free from "Unsuitable materials". Unsuitable material shall include material from swamps, marshes and bogs, peat, logs, stumps, roots and other perishable or combustible material and highly organic clay and silt material having a liquid limit above 65 %, or more than 80 % passing the 75 microns sieves to BS 410 or such other material as the Engineer may decide.

The materials for embankment construction shall have a CBR of not less than 15% measured after a 4-day soak on a laboratory mix compacted to a dry density of 95 % MDD (AASHTO T180), a swell of less than 1 % and a Plasticity Index of less than 30 %. All fill material in embankments, except the 300 mm below formation shall be compacted to 95 % MDD. The fill material in the layer 300 mm below formation (subgrade) in embankments shall be compacted to 98 % MDD.

The materials for the embankment construction shall not contain oversize materials larger than 100 mm, and for the 300 mm layer below formation level shall not contain oversize larger than 50 mm.

The selected fill materials for shoulder construction shall have less than 30% passing the 75 micron sieve to BS 410, shall have a Plasticity Index less than 8 and shall have a soaked CBR of not less than 15%, measured after a 4-day soak on a laboratory mix compacted to a dry density of 95 % MDD and shall be compacted to 97% MDD.

#### **201.04. Preparatory work**

Prior to commencing earthworks all the required site preparation, site clearance and demolition shall be completed in compliance with chapters 101, 102 and 103.

#### **201.05. The stockpiling of topsoil**

Topsoil must be stockpiled in locations separated from the earthworks and apart from any other type of soil or materials.

#### **201.06. Construction works**

The construction will be executed according to SNiP 3.06.03-85.

##### **General directions:**

It is forbidden to damage the ground, topsoil, crops, buildings and installations outside the precise area delineated for the execution of earthworks. Haul roads, where required, must be set out beforehand and approved by the Engineer. Haul road provision will be entirely at the cost of the Contractor who must abide by all local regulations and requirements as well as all the requirements of this specification.

#### **201.07. The operation of borrow pits**

Where the Contractor finds it necessary to import material for earthworks onto the site from borrow pits he shall be entirely responsible for the location and operation of such pits and for obtaining all necessary permits and authorisations as well as for all acquisition of borrow pit areas and meeting all claims for compensation resulting from the operation of such borrow pits. The operation of borrow pits shall comply in all respects with all requirements of this specification.

Borrow pits will be executed in a neat and regular manner so as measurements can be made when the work is finished.

The borrow pits will be restored according to the national norms and standards and in accordance with the requirements of this Specification.

#### **201.08. The stockpiling of material**

Where the Contractor finds it necessary to stockpile material arising from the excavations contingent upon slip remedial works he shall be entirely responsible for the location and operation of suitable storage areas and for obtaining all necessary permits and authorisations as well as for all acquisition of storage areas and meeting all claims for compensation resulting from the operation of such areas. The operation of storage

areas shall comply in all respects with all requirements of this specification. The areas used for storage will be restored according to the national norms and standards and in accordance with the requirements of this Specification as set out in relation to Borrow and Spoil areas.

## **201.09. Roadbed Preparation**

The roadbed preparation of the in-situ treatment of the roadbed below the embankment fill shall be executed as follows:

### **a) Embankments on existing slopes less than 1:3**

The cleared area will be scarified or loosened to a 150 mm depth with a plough or a scarifier and compacted to 92 % MDD (AASHTO T180) to a minimum depth of 150 mm.

### **b) Embankment on an existing slope steeper than 1:3**

Cut horizontal benches in the existing slope to a sufficient width to accommodate placing and compacting operations and necessary equipment. Bench the slope as the embankment is placed and compacted in layers. Begin each bench at the intersection of the original ground and the vertical cut of the previous bench. Benches need be no deeper than two lifts of fill material; they may be cut as the work of filling proceeds and the material arising from benches may be blended in with the fill material as work progresses. No measurement or payment will be made for the work of benching which shall be considered as an ancillary work to the construction of embankments. The in-situ treatment of the roadbed on which the embankment will be constructed shall be compacted to minimum 92% compaction of MDD to a minimum depth of 150 mm.

## **201.10. Construction of Embankments**

The embankments will be executed according to SNiP 3.06.03-85, SNiP 2.05.02-85 requirements.

The material for construction of embankment shall be obtained to the maximum extent possible from the general works of excavation on the site of the Works. Shortages of material shall be made up by excavation in borrow areas.

In constructing embankments, soil shall be placed and compacted in layers of optimum thicknesses of 150 mm; unless as a result of site compaction trials, the Contractor has satisfied the Engineer that his compaction plant is capable of consistently achieving the specified densities at a greater depth, but in no case shall this depth exceed 250 mm.. The embankment construction shall be compacted to a minimum 95% of MDD with a field moisture content +/-2% of the OMC.

During the construction of embankments the Contractor shall control and direct constructional traffic uniformly over the full width. Fill material shall not be stockpiled on embankments without the express permission of the Engineer.

When constructing embankments up to and over culverts, the Contractor shall raise the embankment equally on each side of such structures and shall unless otherwise instructed by the Engineer carry out this work concurrently with the filling to the structure as is feasible without damaging the structure.

The Contractor shall form the embankment to the dimension and levels shown in the Contract Drawings. No payment shall be made to the Contractor for any additional volume due the construction greater than dimensions shown on the drawings.



At all times the Contractor shall ensure that earthworks are not damaged by weather or traffic. In the event of such damage occurring the Engineer may withdraw approval from affected Works until the Contractor has carried out repairs to restore the Works to their original condition. The expenses of such repairs and additional testing will be borne by the Contractor

### **201.11.     Compaction**

During compaction this moisture of the compacted backfill must not vary from the optimum moisture content by more than 2%. The optimum moisture content for compaction (OMC) and density shall be determined by testing according to SM GOST 22733-2002 and approved by the Engineer. Following approval moisture content of the material for compaction it shall not deviate from the approved value by more than +/- 2%. In the event that soil conditions or type render the approved OMC invalid a revised OMC shall be determined by new tests and approved.

The particle size distribution is determined according to SM GOST 12536-79. Having the Engineer's approval the rate of compaction is determined according to SM GOST 5180-84 using Kovaliov's equipment.

The types of compaction equipment to be used and the amount of rolling to be done shall be determined through compaction trials and shall be such as to ensure that the specified densities are obtained without damage being done to lower layers or structures. During compaction the layer shall be maintained to the required shape and cross-section, and all holes, ruts and laminations shall be removed.

### **201.12.     Cutting and Finishing of Slopes**

The cutting, the levelling and the finishing of the slopes will be executed according to SNiP 3.06.03-85, SNiP 2.05.02-85 stipulations.

### **201.13.     Formation of Subgrades**

Where the pavement is to be placed on the completed earthworks for embankment construction the upper 300 mm shall be classified as subgrade.

The subgrade shall be compacted in two layers to at least 98% of MDD. The materials for the subgrade layers shall have a CBR of not less than 15% measured after a 4-day soak on a laboratory mix compacted to a dry density of 98 % MDD (AASHTO T180), a swell of less than 1 % and a Plasticity Index of less than 30 %. Each subgrade layer of pavement shall be finished to a surface profile parallel to the finished surface of the pavement shown on the drawings within the level tolerance of +0 / -35mm. Where the surface is within this tolerance but lower than the design level the Contractor may either raise the level by scarifying, adding extra material, mixing and recompacting, or may make good the defect by the use of extra material in the next course at his own cost. If the surface is out of tolerance it shall be made good by either grading off the excess material or by scarifying, mixing and adding material as appropriate, recompaction shall be carried out in either case.

### **201.14.     Construction and Shaping of Shoulders**

Where shoulders are to be constructed or reconstructed they shall be formed using selected fill as specified in Sub-Clause 201.03. Where required the existing shoulders

shall be reshaped and regraded to conform to the required cross sections. Excess material shall be removed from the site and run to spoil or additional, approved material shall be provided as necessary.

## **201.15. Excavation of Benches**

Where the construction of benches having a vertical height greater than 750 mm and is specifically called for in the drawings or instructed by the Engineer, the excavation of such benches shall be measured and included in the volume of general excavation and the required volume for filling these benches shall be included in the measured volume of embankment construction.

No measurement shall be made of the volume of benches required to be cut in the normal course of embankment construction as described in Sub-Clause 201.09 above and such work shall be considered ancillary to the general work of excavation and forming embankment.

## **201.16. Geotextiles**

### **201.16.01. Introduction**

This work consists of furnishing and placing geotextile as a permeable separator or permanent erosion control measure.

Geotextile types conform and are designated as shown in AASHTO M288

### **201.16.02. General**

Where placing a geotextile on native ground, cut the trees and shrubs flush with the ground surface. Do not remove the topsoil and vegetation mat. Remove all sharp objects and large rocks. Fill depressions or holes with suitable material to provide a firm foundation.

Replace or repair all geotextile that is torn, punctured, or muddy. Remove the damaged area and place a patch of the same type of geotextile overlapping 1 meter beyond the damaged area.

### **201.16.03. Separation and Stabilization Applications**

Place the geotextile smooth and free of tension, stress, or wrinkles. Fold or cut the geotextile to conform to curves. Overlap in the direction of construction. Overlap the geotextile a minimum of 0.5 meter at the ends and sides of adjoining sheets or sew the geotextile joints according to the manufacturer's recommendations. Do not place longitudinal overlaps below anticipated wheel loads. Hold the geotextile in place with pins, staples, or piles of cover material.

End dump the cover material onto the geotextile from the edge of the geotextile or from previously placed cover material. Do not operate equipment directly on the geotextile. Spread the end-dumped pile of cover material maintaining a minimum lift thickness of 300 millimeters. Compact the cover material with rubber-tired or nonvibratory smooth drum rollers.

Avoid sudden stops, starts, or turns of the construction equipment. Fill all ruts from construction equipment with additional cover material. Do not regrade ruts with placement equipment.

Place subsequent lifts of cover material in the same manner. Vibratory compactors may be used for compacting subsequent lifts. If foundation failures occur, repair the damaged areas and revert to the use of nonvibratory compaction equipment.

#### **201.16.04. Measurement**

Measure earthwork geotextile by the square meter excluding overlaps. The accepted quantities, measured as provided above, will be paid at the contract price per unit of measurement for the pay item listed below that is shown in the bid schedule. Payment will be full compensation for the work prescribed in this Section. No allowance will be made for overlaps, cutting, wastage, etc. and no additional payment will be made for any special handling, storage or transport requirements; all such shall be included in the basic rate.

### **201.17. Embankment Erosion Protection**

#### **201.17.01 Introduction**

The works under this chapter include the provision of protection to embankment slopes on land slide sections as presented in the Geotechnical drawings.

#### **201.17.02 Materials**

The materials used for these works must comply with the following requirements:

Crushed stone	M GOST 8267-93***
Geotextile (for filter function)	item 014.03 of Technical specification

#### **201.17.03 General requirements**

The steep ridge slope and the embankment slopes shall be protected against erosion as shown in the Geotechnical drawing GDXX. The road surface drainage is arranged as shown the design with concrete side drains. The erosion protections comprise of geotextile filter and granular fill composing of crushed stone (#10/40 mm) with layer thickness of 1000 mm. The existing topsoil and disturbed loose fill shall be cut as step wise to enable effective compaction of the granular fill as shown in the Drawings.

#### **201.17.04 Protection layers construction**

Shaped the existing slope and the road embankment slope as shown in the Drawings GDxx.

Place and anchor the geotextile on an approved smooth-graded surface. For slope or wave protection, place the long dimension of the geotextile down the slope. For stream bank protection, place the long dimension of the geotextile parallel to the centerline of the channel.

Overlap the geotextile a minimum of 300 millimeters at the ends and sides of adjoining sheets or sew the geotextile joints according to the manufacturer's recommendations. Overlap the uphill or upstream sheet over the downhill or downstream sheet. Offset end joints of adjacent sheets a minimum of 1.5 meters. Pins may be used to hold the geotextile sheets in place. Space pins along the overlaps at approximately 1-meter centers.

Place slope protection aggregate on the geotextile starting at the toe of the slope and proceed upward. The protection aggregate shall be laid compacted in layers to 95 % MDD (AASHTO T180)

## **201.18. Acceptance of work**

The acceptance of the earthworks is made according to Sub-Clause 001.04 with the condition of carrying them out according SNiP 2.05.02-85, SNiP 3.06.03-85, project stipulations and to Engineer's instructions and approval.

### **Measurements**

The measurements will be done as follows:

#### **a) Embankment Construction using material from General Excavation or from Borrow**

Measurement will be in cubic meters in final position to the lines and levels shown on the drawings measured to the nominal ground level after removal of any topsoil to the depth as instructed by the Engineer less any volume to be paid as embankment using material from stockpile. The item includes the roadbed preparation of the in-situ ground below new embankment. The Contractor will make any necessary adjustments to levels to allow for settlement of the embankment or of the foundation on which the embankment is placed. Fill to any areas where unsuitable material has been removed to the instructions of the Engineer will be measured under this item.

#### **b) Excavation**

Excavation to existing shoulders, embankments or cutting slopes will be measured in cubic meters. The item will include for the excavation of any materials found with the exception of rock. Suitable material from the excavation, approved by the Engineer for such use, shall be incorporated in embankments, or if of suitable quality used as select fill to shoulders, and all other material, unsuitable or surplus, shall be taken off-site and disposed of in spoil areas in accordance with the Specification. (The removal of paved areas and foundations to paved areas is covered in Chapter 310). The item includes for the loading and transport of material from areas of cut to the site of embankment, to shoulders or to spoil. Excavation of benches is included under general excavation but will only be measured and paid for when the benches are greater than 750 mm. In vertical height and are specifically called for in the drawings or are instructed by the Engineer.

#### **c) Borrow Materials**

Materials obtained from borrow pits will be measured in cubic meters as the volume of material calculated as being required for incorporation into the Works. The item includes for incidental work as detailed in Sub-Clause 201.07. The volume of material eligible for payment as Borrow shall be the volume required to make good the required volume of Embankment construction after deducting the volume of material available from Excavation and from all other excavation works where excavated material is approved by the Engineer for use in Embankments. The item includes for the loading and transports of material from borrow pits to the site of embankment.

#### **d) Shoulders**

Select fill for shoulders shall be measured in cubic metres of material required to conform to the standard cross sections. The rate shall include for sourcing the material, loading, transporting, unloading, placing shaping and compacting. The

regrading of shoulders shall be measured in square metres of shoulder regraded and the price shall include for the costs of running surplus material to spoil and for the supply of additional surface material where required to make up to level.

**e) Embankment Erosion Protection**

The slope protection and repair works with reinforced concrete cast-in-situ and the river bed protection with boulder rock will be measured in square meters of the protected or repaired surface.

The work of filling and making good the cone slopes with free draining material will be accepted and measured in accordance with chapter 500.

**Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter. The rate shall include full compensation for procuring, furnishing and placing the material, including excavation, the cutting of benches, transporting, preparing, processing, shaping, watering, mixing and compacting the material to the densities as specified.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
20101	Regrade Shoulders	Square Metre
20102	Embankment construction using materials supplied from Common Excavation or Borrow	Cubic Metre
20103	Select Fill to Shoulders	Cubic Metre
20104	Excavation in all materials including slipped soil and benches with material transported to embankment or to spoil.	Cubic Metre
20104A	Excavation of waste concrete after culvert demolition with transportation to spoil.	Cubic Metre
20105	Excavate materials in Borrow pit and transport to site of embankment	Cubic Metre
20106	Shape and compact subgrade	Square Metre

Payment for the formation of embankment will be made in full when the embankment has been placed, compacted to Specification and trimmed to shape.

Payment for excavation will be made in full for excavated materials to be placed in Embankment when the compacted embankment is approved by the Engineer.

For excavated materials directed to be run to spoil, either as unsuitable material or as surplus to requirements, or to be otherwise disposed of, payment will be in two parts: one half of the payment due will be made when the material is removed from site and the

other half of the payment due will be made when the spoil areas or other disposal sites have been completely made good in accordance with the requirements of this Specification.

Payment for excavation in Borrow areas will be in two parts: one half of the payment due will be made when the borrowed material is placed in Embankment and the other half of the payment due will be made when the borrow areas or pits have been completely made good in accordance with the requirements of this Specification.

## **CHAPTER 202.        THE EXECUTION OF DITCHES**

### **202.01.        Introduction**

This chapter deals with the execution of all ditches outside the road cross-section, other than roadside drains already included in the item for general excavation.

### **202.02.        Preparatory work**

The ground will be cleared before the commencement of works according to the requirements of chapter 102.

### **202.03.        General**

The ditches will be executed according to the project design and, if necessary, any detail design required on site and the additional instructions of the Engineer, specifying the ditch dimensions, the bottom grade and the horizontal location.

The ditches will be cleaned periodically and kept in such conditions that water flow in the ditches is wholly unobstructed.

Where directed by the Engineer or called for in the drawings the material arising from ditch excavation shall be placed on the downhill side of the ditch as a bund to increase capacity and provide additional protection to downhill areas. Such bunds shall be constructed with a constant level difference between crest of bund and invert of ditch. Material will be transported along the line of the ditch as necessary to meet this requirement. Bunds shall be compacted to 98% of the theoretical maximum requirement determined by SM GOST 22733 -77.

At the end of the execution and before the issue of the Taking-over certificate, all ditches will be completely cleaned of tree branches, debris, silt and any other obstructions of whatsoever nature.

Materials arising from the excavation of ditches shall be used in the construction of embankments unless utilised in bunds or unsuitable or surplus to requirements. '

### **202.04.        Works acceptance**

The acceptance of the executed ditches and bunds will be done according to Sub-Clause 001.04 stipulations.

#### **Measurements**

The work for execution of the ditches will be measured in cubic meters of material

required to be excavated.

#### **Payment**

The measured volume, as indicated above, will be paid at the contract price per unit of measurement indicated as follows:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
20201	Excavation of ditches outside the road cross section	Cubic Metre

Payment for the excavation of ditches shall include for the transportation of material to embankment sites or to approved spoil areas and for the incorporation of the material into the embankment or for the making good of spoil areas as appropriate and for the construction of bunds as described above. Payment shall be made in full for excavated materials placed in embankment or in bunds when the compacted embankment is approved by the Engineer. For excavated materials directed to be run to spoil or to be otherwise disposed of, payment will be in two parts: one half of the payment due will be made when the material is removed from site and the ditch properly shaped and accepted and the other half of the payment due will be made when the spoil areas or other disposal sites have been completely made good in accordance with the requirements of this Specification.

## ***CHAPTER 203. EXCAVATION AND BACKFILL FOR STRUCTURES***

### **203.01. Introduction**

The Chapter deals with excavations for all kinds of structures.

The works include the excavation for foundation pits and foundation works and their backfilling using appropriate soil taken from the original excavation or borrow pit and the transportation of surplus materials to a site of embankment or to approved spoil areas.

### **203.02. Materials for Backfill**

The soil used for backfilling works shall not incorporate unsuitable material as specified in Sub-Clause 201.03, oversized material, clay or soil susceptible to moisture movements. Back fill materials should be of granular materials equivalent to sub-base standards as required for the road works.

### **203.03. Preparation**

The ground will be without vegetation and the remaining materials shall be in accordance to Chapters 101, 102, 103 and SNiP 3.02.01-87.

### **203.04. Generalities**

The excavation works for trenches, or foundation pits shall be carried out to the level indicated in the drawings without disturbing the underlying materials. This excavation shall include for any bedding required for the structure.

The Contractor is responsible for the design, supply, mounting and movement of any

revetment or supporting structure required. Such revetment or support shall be supplied whenever the depth of excavation exceeds 1.5 metres or whenever the Contractor considers it necessary at any lesser depth. Without in any way relieving the Contractor of his responsibility for the provision of temporary works and for the safety of his workers the Engineer may, if he considers circumstances warrant, direct the Contractor to modify his working methods to provide greater protection for his workers and the Contractor shall thereupon provide such greater protection at his own cost.

The Contractor is responsible for, and must provide, such temporary works, including items such as temporary bridges for pedestrians and vehicles, as may be necessary to permit the general public free and unobstructed use of the roads throughout the execution of the works wherever the works intersect with any public facility.

All excavation will be provided with safety barriers, warning signage, lighting, water pumping and drainage as required for safe working conditions.

Backfilling shall be carried out simultaneously and equally on both sides of the structure to avoid unequal lateral forces.

When backfilling with soil, material will be compacted at +/- 2% of the optimum moisture content determined according to SM GOST 22733-2002.

Backfill materials will be compacted for each course, until the homogenous density will be no less than 98% out of the maximum density, according to SM GOST 22733-2002.

Any excavation and filling of the foundation pits shall be approved by the Engineer.

### **203.05. Preparation of Foundation works**

Where ground conditions are such that a satisfactory foundation at final excavation level can not be achieved the Contractor shall remove the unsuitable material either until a suitable material is encountered or to the depth and width agreed by the Engineer and it shall be replaced with approved material compacted to 95% in accordance with SM GOST 22733-2002.

### **203.06. Bedding**

Where shown on the drawings or directed by the Engineer bedding material shall be placed beneath the structures. Depth of excavation shall take into account the required thickness of any bedding. Bedding shall be a granular, free draining material conforming to SNiP 2.05.02-85.

#### **a) Structures other than culverts**

Place, shape, and compact bedding materials confirming to the specified standard in layers not exceeding 150 mm.

#### **b) Culverts**

The bottom of the excavation shall be compacted to 92 % MDD (AASHTO T180) prior to the placement of granular bedding layer or concrete foundation. The granular bedding layer, in the thickness as specified in the drawings, shall be compacted to 95 %MDD( AASHTO T180), and in layers not exceeding 150 mm. Bedding shall be according to VSN 81-90, SNiP 2.05.03-84 and typical Album 3.501.1-144, also VSN 24-88. Where applicable, recess the shaped bedding to receive the joints according to SNiP 2.05.03-84.



### **203.07. Backfill General**

All backfill shall conform to typical drawings 3.501.1-144 and VSN 24-88. The largest stone shall not exceed 75 mm in its longest dimension.

#### **a) General**

Place backfill in horizontal layers not exceeding 150 mm in depth. Compact each layer according to Sub-Clause 203.08.

Bring backfill up evenly on all sides of the structure, and extend each layer to the limits of the excavation or to natural ground.

#### **b) Culvert**

Place and compact backfill material under the exposed portion of the haunch. The Contractor shall take all necessary steps as directed by the Engineer to prevent frost susceptibility of soils around and under culverts. Extend each layer to the sides of the excavation, the natural groundline, or 3,5 metres beyond the edge of the structure, whichever is less. Repeat the layering process to a minimum of 300 mm above the pipe top.

Material for ditch backfill shall be suitable soil taken from cuts or borrow areas. Materials are to be placed in layers of not more than 20cm thick layers and shall be compacted in accordance with subsection 201.11

### **203.08. Compaction**

Compaction shall be obtained through the use of mechanical equipment such as rubber tired rollers, vibrating rollers (steel wheeled), sheepsfoot rollers, hand operated plate vibratory machines, and mechanical or hand tamping in very restricted areas.

Compaction Requirements are as follows:

- Under structures:  
98 % of maximum density (according to SNiP 2.05.02-85)
- Structures and trenches in roadway or beside roadway:  
93% of maximum density
- Structures and trenches in right of way but not part of travelled way:  
90% of maximum density
- Trenches off right of way:  
Not less than 90% of maximum density

Only materials meeting the backfill requirements standard shall be used.

### **203.09. Acceptance**

The work will be accepted for payment providing that it has been built in conformance to the drawings and specifications and approved by the Engineer including Chapter 001.

#### **Measurement and Payment**

Structural excavation, bedding, foundation fill, backfill and temporary support of

excavation will not be measured for payment. These costs shall be included in the cost of the structure.

## **CHAPTER 204.        *SHAPING AND PLANTING OF SLOPES AND EXCAVATED SURFACES***

### **204.01.        Introduction**

The chapter deals with the finishing of earthworks comprising the spreading and shaping of topsoil, seeding and other forms of vegetating and watering as necessary throughout the period of germination and first growth until a viable, self sustaining, vegetative layer has been established.

### **204.02.        Materials**

Depending on the method adopted, materials shall conform to the requirements of:

#### **Hydroseeding**

ENIR E2-1-45

#### **Seeding**

ENIR E18-45

#### **Bushes**

Bushes and shrubs shall be selected from locally available stock and approved by the Engineer. Approved bushes shall have a height, when fully grown, of some 1.5 to 3.0 meters and shall be of species which exhibit a strong and extensive root system with dense foliage.

### **204.03.        Seeding Season**

Seeding will be carried out at the start of the growing season. Seeding shall not be carried out during strong winds, in very wet soil, in frozen soil, or under other unsuitable conditions.

### **204.04.        Ground preparation for seeding**

The selected ground will be graded to final shape and lightly scarified; topsoil spread to a depth of not less than 150mm and vegetation, stones bigger than 50mm, etc. will be taken out. The topsoil will be lightly compacted and then scarified to a depth of 100mm. Planting and seeding will take place immediately after scarification.

Bushes shall be planted by excavating a hole not less than 50 cm. diameter by 50 cm deep. The bush shall be securely rooted in the prepared hole using a growing medium of black soil, peat moss and sand approved by the Engineer. The hole shall be filled to within 5 cm of the original ground level leaving a depression around the plant which will hold water during watering. If bush vegetating is carried out using cuttings rather than young bushes, they shall be planted in "nests" of 5-6 cuttings of a length of 0.5 to 0.8 m. planted at a depth of 0.45 to 0.6 m. using a prepared hole as above.

#### **204.05.      Watering**

The planted area will be lightly watered 10 days after seeding, or earlier if required in exceptionally dry weather. Watering procedures and equipment shall be so designed that adequate water is provided for germination and growth at all times and that no erosion of the topsoil takes place. Watering shall preferably be carried out in the late afternoon or evening.

#### **204.06.      Fertilization**

According to ENIR E2-1-45 or ENIR E18-24.

#### **204.07.      Seeding and Planting**

The seeds shall be spread in accordance to ENIR E2-1-45 or ENIR E18-24.

Bushes of approved, selected species will be planted on all embankment and cutting slopes at the rate of approximately one young bush or one "nest" of cuttings per 5 sq.m. Bushes or nests will be planted in irregular patterns with a bias towards contour planting.

#### **204.08.      Preparation of Seeds**

Preparation of the seeds will be done in accordance to ENIR E2-1-45 and/or ENIR E18.

#### **204.09.      Protection and maintenance of the plants**

Protection and maintenance for growing plants will be provided including watering as needed until works acceptance.

The Contractor shall rectify any areas where seeding has failed to germinate and he will repeat the seeding exercise with the use of additional fertiliser, lime or ammonium nitrate as necessary and using supplementary or alternative seeds as appropriate.

Three months after bushes have been planted an inspection will be made and any bushes which are not growing properly shall be removed, the planting location reprepared and fertilised and a new specimen planted.

#### **204.10.      Works acceptance**

The works shall be accepted in accordance with the Technical Specifications including Chapter 001. The works will be paid 50% on completion of the seeding exercise and 50% when the Engineer is satisfied that a complete, vigorous and viable growth of grass and bushes has been satisfactorily established over the whole area under consideration which shall not be less than 2000 sq.m.

#### **Measurements**

Water to establish and maintain germination will not be measured but will be included in the seeding cost per square meter.

The works measured as indicated above and confirmed by the Engineer will be paid according to the Unit Price of the Contract indicated in the tender. The payment is made for the completed works indicated into the present chapter.

## **Payment**

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
20401	Placing of topsoil in nominal 150mm layer	Cubic Metre
20402	Planting with approved grasses and bushes	Square Metre
20403	Trimming and shaping of slopes	Square Metre

## **CHAPTER 205. PLANTING OF TREES AND SHRUBS**

### **205.01. Introduction**

The chapter deals with the planting of trees, both at the roadside and on embankment slopes or other areas as directed.

### **205.02. Materials**

Materials shall be deciduous trees and large shrubs, such as poplar and willow trees, which experience has shown will be suitable for the locations in which they are to be planted.

### **205.03. Planting Season**

Planting will be carried out at the start of the growing season. Seeding shall not be carried out during strong winds, in very wet soil, in frozen soil, or under other unsuitable conditions.

### **205.04. Planting**

Trees shall be planted out in pits suitable for the seedlings dimensions and species. Pits shall be dug by excavators or by earth augur machines, in cases where the sites are inaccessible to equipment; pits shall be dug by hand. Edges of machine pits will normally require hand trimming.

Each pit shall be partially filled with fertile soil with added compost, humus and fertiliser as required and appropriate for the species being planted. For plants with bare or spreading roots the initially charge of soil shall be formed into a hillock at about half the hole depth and for plants with root balls into a pillow. Pits shall then be filled in layers with further fertile soil, each layer being carefully and firmly compacted. Before planting the tree roots shall be trimmed and the crown pruned as appropriate for the species. Trees shall be planted at spots indicated by the Engineer or, for general tree cover at about 8 meter spacing or such other spacing as may be suitable for the species.

### **205.05.      Watering**

Immediately after planting, the tree shall thoroughly watered with about 25 litres of water soaked into the planting soil. Thereafter the newly planted trees shall be carefully monitored for signs of wilting or drying out and additional watering carried out as necessary depending on the climatic conditions and the condition of the plants. Watering shall preferably be carried out in the late afternoon or evening.

### **205.06.      Fertilization**

According to ENIR E2-1-45 or ENIR E18-24.

### **205.07.      Protection and maintenance of the plants**

Protection and maintenance for growing plants will be provided including watering as needed until works acceptance.

Three months after trees have been planted an inspection will be made and any trees which are not growing properly shall be removed, the planting location reprepared and fertilised and a new specimen planted.

### **205.08.      Works acceptance**

The works shall be accepted in accordance with the Technical Specifications including Chapter 001. The works will be paid 50% on completion of the planting exercise and 50% when the Engineer is satisfied that a complete, vigorous and viable tree growth has been satisfactorily established. Payment will be per tree finally accepted. Payments on completion of planting will be deducted in the event that no tree is finally established.

#### **Measurements**

Water to establish and maintain germination will not be measured but will be included in the planting cost per tree.

The works measured as indicated above and confirmed by the Engineer will be paid according to the unit price of the Contract indicated in the tender. The payment is made for the completed works indicated into the present chapter.

#### **Payment**

The payment will be made under the following item.

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
20501	Planting of trees	Number

### 3. PAVEMENT

#### **CHAPTER 301.      *Cold in place Recycling of the Asphalt Concrete Pavements***

##### **301.01.      Introduction**

The work includes recycling the existing asphalt pavement materials to be recovered through milling which shall be mixed with new aggregates in such a proportion that the blended mix complies with the required gradation and other specified properties, as specified elsewhere.

This work includes the milling of the existing asphalt layer, and if required part of the base materials, adding of unbound crushed stone or of precoated crushed stone (if necessary) to the milled asphalt material. The addition of mineral binder (usually cement), water and additives (if necessary) and the mixing of the constituents, and the placing of the mix as a structural compacted layer. All the above listed operations are performed directly on site, on the road, or as instructed by Engineer.

When the proportion of the unbound crushed stone in the milled asphalt mixture is more than 35 %, precoated crushed stone is added into it. The properties of the mixtures are determined by samples of a height and diameter of 71.4 mm, compacted under the action of a load of 7 MPa at a temperature of  $20 \pm 2$  °C and dried up to a constant weight after 24 hours of damp storage. The performance characteristics must be in compliance with the requirements for the highly porous asphalt concrete according to Table 4 of the SM GOST 9128-84 (except the coefficient of long term water resistance).

##### **301.02.      Materials**

The materials must comply with the following requirements:

Portland Cement Type 400	SM GOST 10178-85
Slag Portland Cement Type 300	SM GOST 10178-85
Crushed Stone	SM GOST 8267-82
Additives	By instruction of the Engineer
Milled Asphalt material	The content of grain size coarser than 50 mm shall not be more than 5 % by weight; The grading envelopes are accepted as the curves for the porous and highly porous, of the coarse grain and fine grain mixtures of a continuous grading for the lower layers of the pavement and of the base according to the SM STB 1033-2008, The content of grain sizes smaller than 0.063 mm shall not be less than 5 % by weight.

##### **301.03.      Construction Requirements**

The working formula of the mixture, including the information about the materials used (supply source, physical-chemical characteristics and others) shall be submitted to the Engineer for approval in writing no later than 21 calendar days prior to commencement of road works.

The indicative content of individual constituents of the mixture by the weight of the asphalt concrete granules is as follows:

Portland Cement (Slag Portland Cement)	2 - 4 %
Crushed Stone added to the milled asphalt	As instructed by the Engineer
Water	2 - 6 %

The final mix design shall be established during field trials and shall be approved by the Engineer.

#### **301.04. Restrictions due to weather conditions**

The works shall be performed when the weather conditions are favorable and at an air temperature not below 0 °C, and in accordance with the Engineer's instructions as may be required.

#### **301.05. Milling of the Pavement**

Milling shall be carried out with purpose designed asphalt milling equipment capable of milling a minimum of 1.5 meters width in a single pass. The milling equipment shall be equipped with automatic line and level control.

#### **301.06. Preparation of mixture**

The preparation of the mixture shall be carried out on site simultaneously with the milling operation or separately, depending on the equipment and method statement as proposed by the Contractor. During the mixing the components added to the milled asphalt materials generally in the following sequence, crushed stone, water for curing, emulsion, cement. The mixture should be evenly colored and should not contain clots of material and the mixing time shall be determined during field trials.

#### **301.07. Distribution and Compaction of the mixture**

- a) The mixture shall be distributed in an even layer, to line and level and to the design cross-section.
- b) The coverage length should be maximized to a full day's production, in order to reduce the number of transversal joints. When cement is used in the mixture, the coverage length shall be restricted taking into account the hardening time of the mixture on the adjacent lane.
- c) Longitudinal joint are to be avoided where possible by performing the works in all lanes simultaneously.
- d) Initially the mixture shall be compacted using a vibrating steel drum rollers, until the specified density is achieved and final compaction shall be performed by steel drum rollers without vibration.
- e) The density of the recycled layer must be no less than 98 % of the density obtained during field trial compaction, as approved by the Engineer.

f) When cement is used in the mixture, the surface of the compacted layer stabilized by cement has to be kept wet by spraying water. Approx. 24 hours after placing the material a vibrating roller is to drive on the surface of the cement stabilized layer to induce micro cracks in the layer. These micro cracks in the layer stabilized by cement are necessary in order to avoid uncontrolled shrinkage cracks appearing in the base course stabilized by cement. These micro cracks in the base course can usually be achieved after three passes of the vibrating roller.

### **301.08. Curing of the recycled layer**

a) After the evaporation of free moisture content (approximately in 2 hours after completion of compaction) the road may be open for traffic. Speed limit of vehicles prior to placing the next layer shall not exceed 40 km/h.

b) The next layer shall not be placed earlier than 4 - 5 hours after placement of the initial recycled layer if during the process of preparation of the recycled layer cement was added. Prior to laying the next layer a tack-coat (chapter 3.07) shall be applied.

c) If the next layer is postponed for more than 48 hours then the initial recycled layer surface shall be treated with bituminous emulsion at a rate of  $1.2 - 1.4 \text{ l/m}^2$ , followed by the spreading of fine material of sizes between 3 - 8 mm at a rate of  $8 - 12 \text{ kg/m}^2$ , with a further rolling of the surface.

### **301.09. Equipment**

#### **Asphalt Milling Machine**

If a milling machine is used as the lead machine, the milled material from the pavement and mixing processes are performed in place by other equipment.

The main characteristics of the asphalt milling machine:

- A working speed of not less than 5 m/min at a depth of 200 mm. Sufficient power, traction and stability to consistently mill up to a depth of 200 mm (accuracy up to 10 mm);
- Automatic level control system;
- Coverage width of not less than 1.5 m.

### **301.10. Acceptance**

Acceptance of the recycled layer shall be carried out in compliance with the requirements of SNiP 3.06.03-85 and as instructed by the Engineer. The properties of the recycled asphalt concrete layer must be compliant with the requirements of SM STB 1033-2008 for porous asphalt concrete. The degree of compaction shall be determined on the basis of core testing. Minimum of 6 cores should be taken from each 5000 m<sup>2</sup> of laid pavement, but no less than 6 during a working day. For accelerated control, the strength of the samples is checked after 24 hours at a temperature of 20 °C by one-axial compression or the stiffness by Marshall. The norms for the strength at 24 hours are established during the design of the mix.



### 301.11. Adjustments for density

The following coefficients shall be applied for payment. If the payment for the materials is done by unit rates per ton, the coefficient is applied for all the materials used for the production of cold-recycled asphalt concrete, payable per ton.

Percent of density of the sample	Coefficient of Payment	Coefficient of Compaction
98 - 100	1	> 0.98 – 1.0
97 - 98	0.95	> 0.97 – 0.98
96 - 97	0.90	> 0.96 – 0.97
95 - 96	0.85	> 0.95 – 0.96
Less than 95	Section rejected	Section rejected

**Note:**

- a) The density of the sample is determined by dividing the average density to the apparent density, being expressed in %;
- b) The coefficient of compaction is determined by dividing the average density of the cores to the density of the specimens remolded from the cores (cl. 4.16 GOST 12801-84).

#### Measurement

The recycled layer is measured in square meters, the bituminous emulsion and additives in tons.

#### Payment

The approved volumes, measured as described above, are payable according to unit rates, specified in the Contract. The payment is performed for the following items:

No.	Item	Unit of Measure
30101	Break out and remove existing concrete pavement	Cubic metre
30102	Prepare base for new or repaired concrete pavement	Square metre
30103	Provide, place and cure new concrete pavement	Cubic metre
30104	Clean existing pavement of remains of previous bituminous treatments of all types	Square metre

## CHAPTER 302. ASPHALT PAVEMENT MILLING

### 302.01. Introduction

This work consists of the milling of the existing asphalt pavement. The milled asphalt shall only be used for the works on instruction from the Engineer.

### 302.02. Construction Requirements

#### Equipment – Asphalt milling machine

The asphalt milling machine should have the following characteristics:

- Working speed of 16 m/min at 50 mm depth.
- Sufficient power, traction and stability to ensure an accurately consistent processing depth of 50 mm.

- Automatic level control system
- Covering width of not less than 1.5 m

### **302.03. Milling**

The existing bituminous pavement is made from different asphalt and gravel shall be milled and processed by at least sieving (if necessary) to meet the requirements for re-use in the regulating layer. The existing bituminous pavement material does not conform to any given grading, but consists locally of larger gravel and finer material.

Milling and removal of existing pavement layers shall be conducted during dry weather conditions. Milling and removal shall be conducted on small sections only as approved by the Engineer. Construction of new pavement layers in such disturbed sections shall be completed as soon as possible. Only after the completion of new pavement layers, except the final surface course, shall another section for removal is approved by the Engineer.

The existing pavement shall be milled at a depth as specified with a minimum milling width of 1.5 m. A traffic lane should be processed to its full width, and the cross-section of the newly obtained surface should be even. The evenness of the surface shall be measured with a 3-m straight-edge, the gap between the straight-edge and the road surface should not exceed 20 mm, and shall be in accordance with SNiP 3.06.03 – 85.

The transition between the milled asphalt lane and the existing pavement shall have a smooth transition to ensure safety of the travelling public.

Before opening the milled surface to traffic all loose asphalt particles and other loose material shall be removed.

### **302.04. Acceptance**

The acceptance of the asphalt milling shall be in accordance with the drawings and Specifications and approved by the Engineer.

#### **Measurement**

The milling of the existing asphalt pavement shall be measured in cubic meters at the depth as specified in the Bill of Quantities.

#### **Payment**

The accepted works shall be paid according to the rates as specified in the Bill of Quantities.

The payment shall be done for the payment items listed below, and which are contained in the bid. The indicated payment is the full amount of remuneration for the works under this chapter.

The payment shall be for the following items:

No.	Item	Unit of Measure
30201	Regulating course of asphalt mixture	Tonne
30202	Milling of existing asphalt pavement	Tonne

## **CHAPTER 303.      *WIDENING AND RECONSTRUCTION OF THE EXISTING CARRIAGEWAY AND PROVISION OF NEW PAVEMENT***

### **303.01.      Introduction**

This work consists of the construction of new full depth pavement. It applies where existing pavement is to be reconstructed and where completely new pavement is to be constructed. New construction may take the form of climbing lanes, of widening of the existing pavement or of wholly new pavement made necessary by a significant change in horizontal or vertical alignment.

### **303.02.      Materials**

The materials used for the construction or reconstructions of pavements have to meet the following requirements:

Asphalt mixture	Chapter 305 and SMSTB 1033-2008
Bituminous primer	SM GOST 11955-82
Crushed stone	SM GOST 8267-93
Bitumen filled Macadam	SNiP 3.06.03.85, VSN 123-77
Cement stabilized pavement	VSN 16-95
Ballast	SM GOST 25607-93
Crushed Grading as 306.04 below Limestone	
Sand	SM GOST 8736-93
Geotextile	AASHTO M288

### **303.03.      General information**

The construction of sections of new pavement in widening, reconstruction or new road shall comprise excavation to the designated subgrade level, compaction of subgrade, sand drainage layer, subbase layer(s), of gravel or crushed limestone, base layer(s) of graded crushed granite, prime coat and asphalt binder course(s) and wearing course. The thicknesses of the various layers are indicated in the Drawings. In conjunction with new pavement works shoulder reconstruction will be required as detailed in chapter 306 of this Specification.

### **303.04.      Construction Procedure**

The whole area of new pavement construction shall be excavated to the required subgrade level and the subgrade compacted to a minimum of 98% MDD (AASHTO

T180) or to a minimum of 100% of the density determined according to SM GOST 22733-2002. Subgrade level after compaction shall be correct for level in all areas within a tolerance of +0 to -35 mm.

Following acceptance of the subgrade a drainage layer of approved sand material shall be placed and compacted using vibratory rollers or vibrating plate compactors. Top of sand layer after compaction shall be correct for level in all areas within a tolerance of +0 to -35 mm.

The sand layer shall be extended beyond the limits of the carriageway beneath the shoulder to meet the side drain or the embankment face.

Following acceptance of the sand layer a subbase of approved material, either ballast meeting the requirements of SM GOST 25607-93 or crushed limestone complying with the following grading requirements:

Sieve size (mm)	Percentage passing by weight
63.0	100
40.0	70 - 100
20.0	50 - 85
10.0	40 - 75
4.75	30 - 60
2.36	20 - 45
1.18	15 - 37
0.075	4 - 15

Compaction shall be by vibrating roller and the degree of compaction shall be not less than 98% MDD (AASHTO T180). On completion of the subbase layer the upper surface of the final course shall be accurate to line and level within a tolerance of +0 to – 35 mm.

Following acceptance of the subbase layer a base of approved, graded crushed granite aggregate shall be laid to the overall thickness shown in the drawings. The material shall meet the requirements of SM GOST 8267-93 and shall be executed in accordance with SNiP 3.06.03-85.

The compacted thickness of any layer of either base or subbase laid, processed and compacted at one time shall not exceed 150 mm and when a greater compacted thickness is required, the material shall be laid and processed in two or more layers. The minimum layer thickness shall be 100 mm. Compaction requirements for the sub-base and granular base shall be at least 98% MDD (AASHTO T180).

Asphaltic binder and wearing courses shall be laid to the levels indicated in the drawings. Asphalt mixtures will be designed, produced and laid in accordance with the requirements of chapter 305 and SNiP 3.06.03-85.

Wherever new asphalt is laid abutting existing asphalt pavement, the edges of the old pavement shall be carefully cut to expose clean fresh vertical joint faces which will be tack coated with bituminous material meeting the requirements of chapter 304 and in compliance with the requirements of chapter 305 immediately before the fresh adjoining asphalt is laid. Minimum compaction requirements for the Binder and Wearing course shall be 98% of Marshall Density (AASHTO T230).

#### **Surface Tolerance**

Surfaces shall be checked for tolerance and shall meet tolerances in accordance with the requirements of chapter 305.

### **303.05. Work Acceptance**

The work of new pavement construction will be accepted according to the Technical Specifications including Chapter 001.

#### **Measurements**

The whole work of new pavement construction shall be measured under the items below in square meters of subgrade, cubic meters of sand, subbase and base and in tonnes of asphaltic concrete. The volumes shall be measured strictly net based on the design levels. Tonnes of asphaltic concrete shall be derived from the net volume converted to tons on the basis of the compacted density.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
30301	Sand drainage layer	Cubic Metre
30302	Subbase courses of ballast or crushed limestone M 300	Cubic Metre
30302A	Sub base courses of ballast or crushed limestone with cement, H=27cm	Cubic Metre
30303	Base courses of crushed granite M 1000	Cubic Metre
30304	Excavation and disposal or reuse of existing pavement material	Cubic Metre

## **CHAPTER 304. PRIME AND TACK COATS FOR SUPPORTING SURFACE**

### **304.01. Introduction**

This chapter deals with the provision and application of prime and tack coats. Prime coat is a layer of cutback bitumen applied to the completed surface of the granular base course as a preliminary to asphaltting. Tack coat shall be applied wherever new asphalt is laid over or adjacent to old asphalt. In the case of major asphalt operations tack coat shall also be use between overlying courses where the underlying course is more than 72 hours old at the time of laying the next course.

### **304.02. Materials**

The materials used have to be in accordance to the following standards:

- Cut-back bitumen SM GOST 11955-82
- Bituminous emulsion SM GOST 18659-81

### **304.03. Equipment**

- Self-propelled bitumen distributor
- Mechanical rotary brush
- Compressor (for particularly dusty base layers)

### **304.04. Surface Preparation**

Before any prime or tack-coat operation is done the surface will be prepared by brushing.

Care shall be taken during brushing of base course that the structure of the base is not disturbed. Water shall not be used in the cleaning of base course, however, just before the application of prime coat and after all brushing is complete, the basecourse should be lightly watered to help promote the penetration of the prime.

The existing or newly laid asphalt surfaces shall be cleaned off every foreign substances or matter, including bitumen or bituminous or non-bituminous joint sealant material, rubber, oils, fuels, markings and loose particles. The Contractor is free to employ mechanical brooms, jet-water devices, sand-blasting or surfaces milling. The method employed must be suitable to prepare and achieve a surface ready for application of tack coat.

After cleaning and before application of Prime or Tack coats the surface shall be inspected and approved by the Engineer who may require further cleaning.

### **304.05. Weather conditions**

If cutback bitumen is to be used for prime or tack coat the work shall only be carried out in settled, dry weather. Tack-coat in particular shall only be sprayed on clean dry surfaces. No prime or tack coat shall be applied during foggy or wet conditions, when rain is imminent, when the wind is sufficiently hard to cause uneven spraying, when the surface is visibly wet (more than damp), when the surface temperature is below 10 °C and when the moisture content of the base is more than 50% of optimum moisture.

### **304.06. Application of Prime and Tack Coats**

Prime and tack coats shall only be laid using an approved bitumen distributor.

Distributors shall be of constant pressure type, self-propelled, and have a minimum binder capacity of 4000 liters.

Distributors shall be equipped with low range speedometer (fifth wheel) in good working condition, so located to be visible to the driver to enable him to maintain accurately the constant speed for spraying at the uniform specified rate. They shall be fitted with a calibrated pressure gauge which accurately records the pressure of the bitumen at the spray bar. Binder pumps shall be capable of maintaining constant pressure during spray runs.

Distributors for cutback bitumen shall be fitted with burners in combination with a circulating pump capable of maintaining the bitumen without overheating within the specified temperature range and an accurately calibrated thermometer for indicating the

spraying temperature of the bitumen.

The spray bar shall be capable of applying bitumen binder to a minimum width of 2.30 meters with provision for application of lesser widths by closing jets. The spray bar shall have the capability of being raised and lowered to specified heights above the road and of being adjusted so that it is parallel with the road surface. The distributors shall be so designed to allow the circulation of hot binder through the spray bar when not spraying.

Spray bars shall be fitted with either slotted spray jets or preferably whirling spray jets, whose essential features are the ability to spray binder uniformly at the specified rate of spray. If whirling spray jets are fitted the spray bar shall be protected by a hood to reduce wind interference. Distributors shall be fitted with hand spraying equipment with nozzle spray attachments for spraying small, inaccessible areas and to correct deficiencies in the spray rate.

Calibrate the asphalt distributor spray bar height, nozzle angle, and pump pressure and check longitudinal and transverse spread rates weekly.

Protect the surfaces of nearby objects to prevent spattering or marring. Ensure even distribution with no areas missed nor with overlap. Spraying will commence with areas adjacent to the edge of the road and then on the centre section to minimize run-off. Similarly spraying will commence at the low end of gradients and inside of superelevated curves.

Prime coat application is to be at the rate directed by the Engineer and will normally be in the range of 0.8 to 1.0 kgm/m<sup>2</sup>. The Engineer will approve the exact application rate, temperature, and area to be treated before application and may make adjustments for variations in field conditions.

Tack coat application is to be at the rate directed by the Engineer and will normally be in the range of 0.25 to 0.4 kgm/m<sup>2</sup>. The Engineer will approve the exact application rate, temperature, and area to be treated before application and may make adjustments for variations in field conditions.

For both Tack coat and prime coat the exact rates of application of tack coat shall be determined from field trials.

If excess asphalt material is applied, squeegee the excess from the surface. Allow the tacked surfaces to completely cure before placing the covering course. Place the covering course within 4 hours of placing the tack coat. No traffic should be allowed on the tack coat, other than unavoidable construction traffic.

Prime coat applications shall be in accordance with the rate directed to a tolerance of +/- 0.1 L/sq.m. and tack coat applications within a tolerance of +/- 0.05 L/sq.m. Actual application rates will be checked in the field.

### **304.07. Works acceptance**

The surface where the prime and tack coats have been laid will be accepted according to the Sub-Clause 001.04.

#### **Measurements**

The quantity of prime coat work will be measured in square meters of binder applied to the road based on the lesser of the recorded rates of spread and the instructed rates of

spread.

Tack coat will only be measured for payment where it is applied to the original asphalt surface immediately prior to the laying of the regulating layer or new asphalt. Tack coat to the subsequent surfaces of the regulating layer, the binder and of any intermediate layers which may be required to make up the required thickness shall not be measured for payment but will be considered an integral part of the asphalt laying process and the cost of such tack coating will be deemed to be included in the rates quoted for the laying of asphalt concrete.

### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
30401	Tack Coat using cutback bitumen, 0.25 to 0.4 l/sq. m.	Litre
30402	Prime-coat using cutback bitumen or bituminous emulsion, 0.8 to 1.0 l/sq. m.	Litre

## ***CHAPTER 305. ASPHALT CONCRETE FOR PAVEMENTS***

### **305.01. Introduction**

This chapter gives the requirements for the execution of one or more courses made from hot asphalt concrete according to SM STB 1033-2008.

### **305.02. Materials**

The materials will be in accordance to the following standards:

Asphalt concrete	SM STB 1033-2008 and section 305.08
Road bitumen from crude oil	SM GOST 22245-90 supplemented by the additional requirements of Chapter 011
Crushed stone	SM GOST 8267-93
Sand	SM GOST 8736-93
Filler	SM GOST 16557-78

### **305.03. General Requirements**

Asphalt concrete road pavement (the preparation, the equipment, the transport, the laying, and the compaction) will be according to Chapter 10 SNiP 3.06.03-85.

Asphalt will be produced in various types according to the job requirements and shall be either fine grained dense or coarse grained dense. Porous mixes are not accepted for the works.



#### **305.04.      Mixing equipment**

The asphalt plant shall be capable of producing a consistent product conforming to these specifications. It shall be of the batch mix type and shall have a rated output capacity of at least 120 tons per hour. Smaller plants of lower output acting in combination are not acceptable.

The proportioning, mixing, and discharging will be automatic. The equipment shall be approved by the Engineer. The asphalt plant scales shall be sensitive to 0.5% of the maximum load that may be required.

The plant shall be fitted with a modern system of emission control for exhaust gases and shall be equipped with effective dust collectors. The system shall collect all fine particles dust discharge and shall be so equipped that the collected fines are available for re-use as filler in the mixes or to be spoiled as appropriate.

#### **305.05.      Asphalt finishers**

Bituminous materials shall be laid by a self propelled spreader finisher equipped with a hopper, delivery augers and a heated adjustable vibrating screed. It shall be capable of laying bituminous materials to the required width and profile without causing segregation, dragging, burning, irregularities or other defects and within the specified level and surface regularity tolerances. Delivery augers shall terminate not more than 200 mm from the edge plates.

Only asphalt finishers having automatic system for level and cross section control, approved by the Engineer will be used for the placing of asphalt layers.

#### **305.06.      The preparation of the supporting surface**

Tack coat shall be provided wherever new asphaltic concrete is laid over existing pavement and wherever a first course of new asphaltic concrete has been exposed to traffic or left to weather to such an extent that the Engineer considers it necessary to provide tack coat in the interests of satisfactory adhesion between the courses. In any event a tack coat will be required wherever a period of more than 10 days is allowed between successive courses. This period may be substantially reduced if the surface of the underlying course is exposed to excessive traffic. Provision of tack coat, other than the initial coat on the old existing asphalt, will not be the subject of any separate payment and is considered to be included in the rate for asphaltic concrete.

Before laying of asphalt and before any tack coating, the surface shall be inspected and approved by the Engineer who may require further cleaning or other preparation before tack coating (if necessary) is allowed to be carried out.

Where the edges of the asphalt course to be laid are bounded by adjacent kerbs, islands, or other upstands, the area of the upstand which will come into contact with the completed asphalt course shall be carefully primed with cutback bitumen to provide an adhesive bond between the freshly laid asphalt and the upstand. Areas of upstands above the asphalt course design level or which will be left exposed for any reason shall be carefully protected during this priming operation with either heavy paper or plastic film carefully taped in place. Kerbs and upstands which remain exposed after completion of the asphalt work must not be stained or marked with bitumen spray/splash. Such marking may lead to rejection of the work area affected with a requirement that the

Contractor shall make good the damage at his own cost. In extreme cases such making good is likely to require the removal and replacement of concrete kerbs.

### **305.07. Weather conditions**

The laying of asphalt concrete courses shall only be done at ambient temperatures exceeding 6°C and rising with an allowable wind velocity of less than 25 km/h and/or at an ambient temperature exceeding 10°C and rising with an allowable wind velocity of less than 55 km/h or for asphalt with a thickness of equal or less than 30 mm with an allowable wind speed of 25 km/h. With falling temperatures all work shall be stopped when the temperature reaches 6°C.

Asphalt concrete shall not be laid when the surface is visibly wet or when rain is imminent.

To the extent practicable, the Engineer and the Contractor shall jointly agree a shutdown date, and subsequently a start up date, for asphalt laying operations such that operations are stopped for the whole of the winter period before any extensive periods of expected rain/snow and do not recommence before there is reasonable expectation of prolonged periods of suitable weather.

In the absence of any agreement on the shutdown period the Engineer shall be entitled to order that asphalt shall not be laid during the period 15th October to 31st March.

### **305.08. Asphalt Mix Design and Testing**

Asphalt mixes to be used in the Works shall be designed by the Contractor in accordance with the Marshall Method as described in the Asphalt Institute Manual MS-2, 6th Edition and the requirements and procedures of SM STB 1033-2008. The Contractor shall allow the Engineer to participate in the mix design process and shall keep him fully informed throughout the procedure. When a satisfactory mix design has been prepared it shall be forwarded to the Engineer with all supporting test documentation for approval. Before approving a mix the Engineer shall confer with the Employer's laboratory that shall be satisfied that the mix is appropriate for conditions in Moldova.

Dense asphalt mix and SMA mix Marshall Specifications:

Type of mix	Marshall blows on each end of specimen	Nominal mix size (mm)	Air voids (%) minimum	Air voids (%) maximum	Stability (kN) minimum	Voids in Mineral Aggregates minimum
SMA	50	10	3.5	5	5.5	18
SMA	50	14	3.5	5	6.0	17
HMA	75	12.5	3.5	5	8.0	14
HMA	75	19	3.5	5	8.0	13
HMA	75	25	3.5	5	8.0	12
HMA	75	38	3.5	5	8.0	11

\*HMA = Hot mixed dense asphalt, SMA = Stone Mastic Asphalt. Porous asphalt shall not be used.

Stripping Test/Water sensitivity Test: Percentage retained stability after immersion in water (ASTM D1075): 75% minimum

As an alternative to the procedure in ASTM 1075, the Contractor may measure the loss of stability on immersion in water by measuring the loss of Marshall Stability. In this case the test procedure shall be modified as follows:

- |                 |   |
|-----------------|---|
| ASTM 1075 7.1.1 | Group 1 - Immerse the test specimen in water for 30 – 40 minutes at 60 degrees Celsius +/- 1 degree. Follow the Marshall procedure to measure the Marshall Stability. |
| ASTM 1075 7.1.2 | Group 2 - Immerse the test specimen in water for 22 – 24 hours at 60 degrees Celsius +/- 1 degree. Follow the Marshall procedure to measure the Marshall Stability.   |

Where the asphalt mix does not meet the requirements for the Water Sensitivity Test (ASTM 1075), the Contractor shall propose the use of a suitable adhesion agent such as Portland cement, hydrated lime, anti-stripping agent or other proprietary agent for the Engineer's approval. The beneficial properties of the proposed agent when incorporated in the mix and the percentage of agent to be added to the mix shall be demonstrated by further test results.

Dense asphalt mix design shall be checked against the refusal density of the extended marshall compaction (TRL Overseas Road Note 31, fourth edition, 1993, Appendix D). A minimum of 2% of voids in the mix (AASHTO T269) shall be maintained to minimize the risk of failure by plastic deformation. This procedure is not required for SMA mixes.

To prevent a harsh mix, difficult to compact, the Contractor may use up to a maximum of 15 % natural (rounded) sand as part of the crushed stone mineral aggregate.

The mix submitted for approval shall be precisely defined with no variables or tolerances. Following approval, the mix as used in the field shall comply with the requirements of SM STB 1033-2008 and with the tolerances given below.

Throughout the course of the Works, asphalt shall be sampled and tested on a regular basis. Samples will be drawn from the mixing plant and/or from the finisher as directed by the Engineer at a frequency of not less than:

- At least one sample for each 400 tons of mixture for regulating and binder course materials and
- At least one sample for each 200 tons of mixture for wearing course materials.

These samples shall be tested for aggregate grading, bitumen content, Marshall Stability, Flow, Voids and Absorbed Water. .

The percentages of aggregate grading as determined by testing shall not vary from the approved mix design values by more than:

- +/- 2% aggregate sizes > 15 mm
- +/- 1% aggregate sizes > 5 mm
- +/- 0.5% aggregate sizes < 5 mm

Bitumen content as determined by testing shall not vary from the approved design mix in binder courses and regulating asphalt by more than +/-0.3% and in wearing courses by more than +/-0.2%.

If tests show that the mix being produced does not comply with these requirements all asphalt work will cease immediately the problem is noted and no further asphalt will be laid until, either the causes of the fault with the existing mix have been established and rectified or until a new mix design has been prepared and approved following the

procedures above.

The thickness and the density of the asphalt course being laid will be checked by coring. At least one 100 mm diameter twin core for each 800 m<sup>2</sup> of asphalt mix laid shall be tested for density, thickness and voids.

With an absolute minimum of 3 cores being taken for any day's work. Cores will be checked for thickness of layer as the average of three uniformly spaced thickness measurements by caliper round the circumference of the core. The compacted asphalt in the field shall achieve a density of at least 98% of the Marshall Density.

The grading and specific gravity of the cold aggregates will be tested as directed by the Engineer but normally not less than once per day.

### **305.09. Bitumen preparation**

The bitumen will be uniformly heated to permit a continuous introduction of bitumen from the storage tank into the mixer.

It is forbidden to heat bitumen to a temperature above 175°C. Bitumen heating shall be by indirect means using oil-filled heating coils or other approved systems. Any bitumen which has been heated above 180°C or has suffered carbonization from prolonged heating shall be removed from the plant and disposed off.

### **305.10. Preparation of the aggregates**

Before introduction into the mixer, the aggregates have to be heated and dried to the correct temperature. Unless otherwise agreed with the Engineer aggregates shall be discharged from the heating process at such a temperature as will ensure their introduction to the mixer at a temperature of between 155 and 170 deg C. The aggregate moisture content at the moment of introduction to the mixer shall in no circumstances exceed 1%.

The burners to be used for heating and drying the aggregates shall be so adjusted as not to damage or contaminate the aggregates either by overheating or by the deposition of soot, oil or other residues.

The mixing plant shall be so designed as to separate the aggregate into not less than four sizes of aggregate which will then be combined by weight to reproduce, within the specified tolerances, the design mix.

The mixing plant shall be designed to ensure the precise weighing of the bitumen to be added to each batch of asphalt being mixed.

### **305.11. Mixing**

The proportioning of bitumen and aggregates in the mixer shall be according to the approved mix design formula.

The mixing period shall be sufficient to achieve a complete coating of the aggregates with bitumen and the complete mixing of filler with bitumen and shall in no case be less than the mixing period recommended by the plant manufacturer.

### **305.12. Transport**

Mixed asphalt material shall be transported from the mixing plant to the laying site in tipping trucks specially reserved and designated for this purpose.

Trucks shall be metal bodies, insulated and equipped with insulated tarpaulin covers. Covers shall be deployed at all times when the truck is being used for the transport of asphalt.

Trucks for the transport of asphalt shall be equipped with ports in each side of the body for the measurement of load temperatures. The Contractor shall supply and maintain suitable heavy duty thermometers (Rototherm or similar or other approved type) at the delivery point, able to measure temperatures at 1 meter penetration into the load, for checking asphalt temperatures prior to discharge into the finisher.

Limited quantities of approved release agent may be used to prevent asphalt material hanging in, or adhering to the body during discharge. Release agents shall be subject to the approval of the Engineer both as regards type and rate of application. Under no circumstances will agents which react with or which are miscible with the binder be permitted. Any members of the Contractors staff found applying such agents will be subject to immediate and automatic removal from the site with an absolute prohibition on their re-employment on the project at any time in any capacity. The Contractor shall ensure that this provision is brought forcefully to the attention of all staff involved in asphalt work.

### **305.13. Supplying and laying**

The supplying and laying of the asphalt mixture will be done according to SNiP 3.06.03-85.

Materials shall be spread, leveled and tamped by an approved self-propelled paving machine. The mixed material shall be supplied continuously to the paver and laid without delay. The rate of delivery of material to the paver shall be so regulated as to enable the paver to be operated continuously and it shall be so operated whenever practicable.

The rate of travel of the paver and its method of operation shall be adjusted to ensure an even and uniform flow of material across the full laying width, freedom from dragging or tearing and without segregation of material.

In confined areas where irregularities or unavoidable obstacles make the use of mechanical laying impracticable, the mixture may be spread by hand. Hand spreading shall be done by staff experienced in the work and the standard of finish of the completed hand spread asphalt shall not be noticeably inferior to the machine laid areas.

No asphalt shall be laid in courses of less than 40mm thickness unless specifically called for in the design. Asphalt wearing course shall not be laid in thicknesses greater than 60mm and asphalt binder course shall not be laid in thicknesses of more than 80mm without first obtaining the specific approval of the Engineer.

### **305.14. Compaction**

The compaction of the mixture will be done according to SNiP 306.06-85. Coefficient of compaction will be 0,99 for dense asphalt layers, 0,98 for porous and high porosity asphalt layers. The tests of compacted asphalt layers will be done according to SM STB 1115-2008. Methods of testing

The Contractor shall provide sufficient rollers of adequate size and weight to achieve the specified compaction. Prior to commencing the laying of bituminous mixes in the permanent works the Contractor shall carry out site trials to demonstrate the adequacy of his plant and to determine the optimum method of use and sequence of operation of the rollers.

Rolling shall be carried out parallel to the axis of the road with transverse movement of rollers being accomplished by gradual diagonal rolls not varying by more than 15 degrees from the axial direction. Sharp turning movements of rollers on fresh asphalt shall not be permitted. The Contractor shall be responsible the repair of any and all damage which may result from the improper or careless use of rollers. The only exception to the use of rollers in an axial direction shall be when the need arises to compact transverse joints. In these cases the rollers shall be turned off the asphalt surface and shall be used at right angles to the axis of the road. All exposed edges of the lane/layer shall be adequately supported by the use of suitable timbers so that the roller(s) may move onto and off the asphalt without deforming the edges. Rolling shall be commenced before the mix temperature falls below 120 C and final compaction shall be accomplished before the temperature falls below 80C. No further rolling will be allowed if the temperature falls below 80C. In general the pattern of rolling shall be started from edge/down side and preceded towards center/upper line. In case of joint rolling should commenced first at the joint.

The compacted asphalt in the field shall achieve a density of at least 98% of Marshall Density. If the average density of all the samples of compacted material taken in any one day is less than 97% of the average density of the laboratory samples taken on the same day, the pavement laid in that day will not be accepted. If the density of any sample taken in that day is less than 94%, the entire pavement laid during that day will be not accepted. It shall however, be open to the Contractor to institute an intense coring program of the affected work to demonstrate to the satisfaction of the Engineer that certain areas of the work meet the overall requirements whilst other areas fail. If the Engineer is so satisfied then only those areas which have not been shown to meet the required standards shall be condemned; provided that no condemned area shall be less than the area represented by one truckload of asphalt and that any test result of less than 94% must result in at least one condemned area.

Compaction of SMA mixes shall commence immediately SMA is placed using exclusively non-vibrating steel drum rollers to meet density requirements as specified. Pneumatic tyre rollers shall not be used for SMA mixes.

### **305.15. Joints, shaping and edge cleaning**

In places where the freshly laid mixture is adjoining the existing pavement or previously laid asphalt, joints will be formed. Such joints shall ensure a perfect and continuous transition between the old and the new surface.

The existing pavement or previous laid asphalt shall be carefully cut to a neat vertical face using an approved cutting device (roller mounted disc cutter or approved alternative), immediately before laying of new asphalt this face shall be covered by a cutback bitumen priming material in accordance with Chapter 304.

Laying new asphalt against an uncut edge of previously laid asphalt shall only be permitted when the previously laid edge is less than 6 hours old and in this case only with the express permission of the Engineer and using procedures approved by the Engineer.

The Contractor shall be fully responsible for ensuring that the required degree of compaction is achieved throughout joint areas. The Engineer may direct that cores for compaction checks be carried out through joints.

The asphalt mixture shall be continuously and uniformly laid, to have the same thickness and surface texture as the previous lane. Great care shall be taken to avoid deforming the edge of the layer by over-rolling. If necessary the edge of the lane/layer shall be confined with timbers of suitable thickness fixed to the underlying layer to permit compaction of the edge.

All material removed during cutting and trimming processes shall be removed from the site and disposed of in accordance with Specification requirements and in a manner approved by the Engineer.

### **305.16. Tolerances on finished work**

As soon as possible after compaction is completed the surface will be checked for tolerance.

Completed asphalt overlay courses shall not be less than the thickness indicated in the drawings and the final levels of asphalt wearing course shall be within a tolerance of +15mm to 0 mm. Levels shall be checked using a grid stipulated by the Engineer comprising not less than 6 points per 100 sq.m. and spaced at intervals which ensure that no more than 30% of the grid points coincide with locations used by the Contractor for setting out the initial surface level control.

A 3 meter straight edge shall be used to check the final surface for regularity after initial rolling and while the material is still hot enough for corrections to be made. Checks shall be made at regular intervals specified by the Engineer, but not less than two checks per lane at 10 meter intervals, and at any other location where the Engineer's staff considers that there appears to be excess irregularity. Checks shall be made both parallel to and at right angles to the axis of the road. A defective area is an area with surface deviations in excess of 5mm relative to the straightedge. If it is shown to be an acceptable procedure, within the capabilities of the Contractor, and resulting in an acceptable surface at the specified degree of compaction, defective areas may be corrected by loosening the material, adding or removing material, reshaping, and compacting. If correction cannot be made in this manner, defective areas shall be removed to the full thickness of the layer and re-laid. Areas to be removed and re-laid shall be not less than one lane in width and 25 meters in length. All costs of rectification shall be borne by the Contractor.

### **305.17. Acceptance procedures**

Asphalt pavements it will be accepted according to the provisions of chapter 002, of this specification and of SNiP 3.06.03-85.

Bitumen acceptance will be on the basis of SM GOST 22245-90 and additional requirements in chapter 011.11.

Bitumen supplied to the site shall be routinely tested for conformity with these Specifications. For bitumen delivered in bulk, tests shall be conducted at a minimum rate of one set of tests per tanker load. For bitumen delivered in drums tests shall be conducted at a minimum rate of one set of tests per 10 tonnes received. These test rates are intended to be used for routine testing when deliveries are confirmed as uniform and of acceptable quality. Initially, the Engineer will order tests at a substantially greater intensity. In addition to the site tests all shipments of bitumen must have a manufacturer's test certificate indicating compliance with all the requirements of the Specification. This test certificate must be presented to and approved by the Engineer before the relevant shipment of bitumen is permitted to enter the site.

Filler acceptance will be made according to the Sub-Clause 012.05.

The material in the asphalt concrete pavements and mixtures will be accepted in accordance to the Sub-Clause 012.04.

The finished pavement courses will be accepted on the basis of Sub-Clause 305.16

All aspects of asphalt work shall comply with the requirements of this chapter.

### **Measurements**

The asphalt pavement works will be measured in tonnes or square meters of each type of asphalt provided as itemized in the Bills. The measurement and payment includes aggregates, bitumen, filler, all mixing, transport, laying and compacting operations, the treatment of joints and application of tack coat (other than one initial tackcoat) as required or directed together with all testing and all other associated works of whatsoever nature. Where measurement is in tonnes, the payable tonnage shall be calculated as the square meters of asphalt laid and accepted multiplied by the lesser of (i) the average thickness as determined by coring (where results greater than the required thickness are treated as being of the required thickness) and (ii) the required thickness, to give the volume of asphalt. This shall then be transformed to tonnage using the average density of the asphalt as determined from density tests on the cores.

Where measurement is in square meters of a specified thickness of asphalt the asphalt shall be measured as the net square meters of asphalt required to be laid in accordance with the requirements of the drawings and the instructions of the Engineer. Where for any reason the thickness of the asphalt course being measured is less than the thickness required as specified and the Engineer permits such reduced thickness to remain, the payment for the area of reduced thickness shall be calculated as the nominal payment due multiplied by the square of the measured average thickness divided by the square of the specified thickness. Average thickness shall be the average thickness as determined by coring (where results greater than the required thickness are treated as being of the required thickness). The area to be considered in any calculation of average thickness for the purpose of adjusting payment shall be as directed by the Engineer.

### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under the Bill of Quantity items set out below. The pavement bill will use either the series of items measured in square meters with the appropriate thicknesses inserted or the three items measured in tonnes:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
30501	Wearing course of asphalt concrete from fine grained dense asphalt Type A M1 Thickness 40mm	Square Metre
30502	Wearing course of asphalt concrete from fine grained dense asphalt Type A M1 Thickness 50mm	Square Metre
30503	Base course made of fine grained porous asphalt concrete M1, Thickness 40mm	Square Metre
30504	Base course made of fine grained porous asphalt concrete M1 Thickness 60mm	Square Metre



30505	Base course made of coarse grained porous asphalt concrete M1 Thickness 80mm	Square Metre
30506	Base course made of coarse grained porous asphalt concrete e M1 Thickness 85 mm	Square Metre
30507	Base course made of coarse grained porous asphalt concrete M1 Thickness 90 mm	Square Metre
30508	Base course made of coarse grained porous asphalt concrete M1 Thickness 100 mm	Square Metre
90202	Geotextile fabric Type 2 as a filter membrane .	Square Metre

## **CHAPTER 306. REMOVING, RESTORING AND REPAIRING THE SHOULDERS**

### **306.01. Introduction**

This chapter deals with the work of excavating existing shoulders and rebuilding with drainage layer, approved backfill and gravel or paved shoulder surface.

### **306.02. Materials**

The materials to be used in the reconstruction of shoulders shall be:

Sand drainage layer	SM GOST 8736-93
Select fill	Select fill with PI < 8 and CBR > 25%
Crushed stone, gravel, sand mixture for the shoulder surface	SM GOST 25607 - 94

### **306.03. The removal and reconstruction of shoulders**

Shoulders will be removed and reconstructed/constructed wherever the pavement works require such works to be carried out (e.g. where the existing carriageway is to be widened, where a lane is to be added, where the pavement is to be reconstructed or where indicated on the Drawings that shoulder reconstruction is required to improve subgrade drainage or as instructed by the Engineer).

Wherever the works of shoulder reconstruction/construction require any of the existing asphalt to be removed, the final position of the required asphalt edge shall be carefully marked and the excess asphalt cut away with a saw (diamond or other abrasive disc cutter) to leave a clean edge against which shoulder construction shall proceed.

Shoulders will first be excavated to depth shown on the drawings or as instructed by the Engineer. In general, excavation shall be carried down to the level of the underside of the sand drainage layer in the base of the carriageway pavement.

Shoulder subgrade will then be compacted at OMC to a density of not less than 95% of maximum dry density (AASHTO T180).

A 200mm sand drainage layer will be placed, continuous with the drainage layer in the pavement and connecting that layer to the side drain or embankment face. Select fill will then be used to bring the shoulder up to the level of the underside of the shoulder

surface layer. Select fill shall be placed and compacted at OMC in layers not exceeding 150 mm in thickness to a density of not less than 97% of maximum dry density (AASHTO T180).

Shoulders will be completed with a 150mm layer of shoulder surfacing material or crushed limestone (M400), compacted at OMC to a density of not less than 98% of maximum dry density (AASHTO T180) adjacent to the carriageway and with topsoil at the back of this layer as shown on the drawings.

Where the pavement layers are to be reconstructed, all layers of shoulder reconstruction shall be constructed simultaneously with the adjacent layers of pavement construction.

The material resulting from the removal of the shoulders may be used for earthworks if it meets the requirements of Chapter 201. If unsuitable, material from shoulder excavation will be removed and disposed of as spoil in accordance with the requirements of this Specification.

#### **306.04. Surfacing of the shoulders with asphalt concrete**

In the event that shoulders are to be surfaced or partially surfaced with asphalt concrete, those parts which are to be surfaced shall be reconstructed simultaneously with the pavement surfacing and in accordance with the requirements for the pavement reconstruction given in chapter 306.

#### **306.05. Acceptance of Works**

Work stipulated in this chapter will be accepted according to Sub-Clause 001.04.

##### **Measurements**

The excavation and disposal of shoulder material and the reconstruction of shoulders shall be measured in cubic meters of material removed or required to be placed except for prime coat which will be measured in square meters and asphalt which will be measured in square meters.

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter. If shoulders are to be asphalted the works of subbase, base, prime coat and asphalt concrete shall be paid under the items given for these works for the reconstruction of pavement in chapter 306. The select fill to shoulder construction will be paid under the Earthworks items for material from Borrow Pits and Formation of Embankment. The demolition (excavation) of the old shoulders shall be paid for under the Earthworks item for general excavation and the provision and spreading of topsoil will be paid under the Earthworks item for supply and spreading of topsoil. Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
30601	M300 shoulder surfacing material 150mm thickness	Square Metre

## **CHAPTER 307.        VARIOUS ASPHALT WORKS**

### **307.01.        Introduction**

This chapter deals with the execution of small asphalt works for sidewalks, kerbs, and pavements at bus stops, etc. The works in this chapter are areas of asphalt which it is not possible to lay with a asphalt finisher and which are not adjacent to, contiguous with or ancillary to areas of bulk asphalt laying carried out with a paver.

### **307.02.        Asphalt mixture formula**

The asphalt used shall be identical with the mixes used for the main works of asphalt paving and the mix and quality of asphalt shall comply in all respects with the requirements of chapter 305. The procedures for checking quality and testing set out in Chapter 305 shall be followed in full, except that the requirements the numbers of tests shall be revised by the Engineer having regard to the volumes of asphalt being produced and placed at any one time.

### **307.03.        Preparation of supporting surface**

The supporting surface will be prepared in accordance with Sub-Clause 304.04 and 305.06 as appropriate. The contact surfaces of the kerbs, islands or other upstands will be coated with a bituminous tack-coat in accordance with the requirements of chapter 304. When the binder is spread, all adjacent surfaces must be protected in accordance with the requirements of Chapter 304 and Sub-Clause 305.06.

### **307.04.        Weather limits**

Asphalting shall be limited to suitable weather conditions as defined in , Sub-Clause 305.07.

### **307.05.        Transport**

Asphalt shall be transported in dedicated trucks complying with the requirements of Sub-Clause 305.12.

### **307.06.        Mixture laying**

Asphalt for small works shall be laid by hand. Laying shall be done by experienced crews, fully equipped with suitable hand tools, shovels, barrows, rakes, screeds, etc. Care shall be taken that asphalt residue does not build up on tools and suitable means shall be provided for heating tools and maintaining them hot throughout the laying and spreading process to facilitate this.

### **307.07.        The compaction**

The asphalt mixture will be compacted to at least 94% of the Marshall density of test samples compacted with 75 blows on each face.

### **307.08. Surface tolerance**

The longitudinal and transverse uniformity will be verified using a 3 meter long metallic straightedge. Areas with deviations of more than 10mm from the straightedge will be rejected. They will be repaired using approved methods or removed and re-laid if repair is not possible.

### **307.09. Works acceptance**

The works will be accepted for payment if such work is in accordance with the drawings and Technical Specifications and approved by the Engineer.

#### **Measurements**

The volume of work is measured in square metres.

#### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter. Payment will be made under the item below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
30701	Hand laid asphalt concrete to small works small size particle; type A MI H	Square metres

### **CHAPTER 308. NOT USED**

### **CHAPTER 309. NOT USED**

## **Chapter 310: Measurement of pavement roughness**

### **310.01.**

Within 28 days after notice to commence, the Contractor shall present to the Engineer the name and qualifications of an independent third party laboratory or testing company that will perform pavement roughness measurements, using the International Roughness Index (IRI). The qualification shall also include the IRI profiling equipment information including manufacturer's specifications and current calibration certificate from an internationally recognized authority, and the qualification and training records of individuals conducting the roughness survey.

### **310.02.**

The Contractor shall not be able to commence with asphalt concrete wearing course until the Engineers approves the testing company or laboratory and the proposed IRI profiling equipment, and the Quality Control (QC) plan submitted by the Contractor as per Appendix B. Any delays in asphalt concrete wearing course construction caused by the Engineer's determination of inadequate qualifications of the testing company, the profiling equipment, and/or the QC plan will be the sole responsibility of the Contractor.

### **310.03.**

All roughness measurements and reporting costs shall be the responsibility of the Contractor.

### **310.04. Measuring IRI**

#### **310.04.1 Introduction**

Pavement roughness is defined in accordance with ASTM E867 as "The deviation of a surface from a true planar surface with characteristic dimensions that affect vehicle dynamics and ride quality." The International Roughness Index is used in this Contract as the standard roughness index for the finished roadway surface. The summary numeric is the IRI in meters/kilometer (m/km). The primary advantages of the IRI are:

1. It is a time-stable, reproducible mathematical processing of the known profile.
2. It is broadly representative of the effects of roughness on vehicle response and user's perception over the range of wavelengths of interest, and is thus relevant to the definition of roughness.
3. It is a zero-origin scale consistent with the roughness definition.
4. It is compatible with profile measuring equipment available in other European countries.
5. It is independent of section length and amenable to simple averaging.
6. It is consistent with established international standards and able to be related to other roughness measures.

#### **310.04.2 IRI Measurement Procedure**

The reference method for obtaining IRI data is based on AASHTO PP 37-04: Standard Practice for Determination of International Roughness Index for Quantifying Roughness of Pavements. The reference method in Appendix to pavement calls for the use of a longitudinal profile measured in accordance with ASTM E-950 as a basis for estimating IRI reported in units of centimeter per kilometer (cm/km).

Roughness data should be measured and reported in IRI units for all sections in both traffic lanes, and in all third lanes sections. The Contractor shall plan the IRI survey as appropriate to obtain meaningful roughness measurements with the profiling equipment to overcome obstacles such as: speed restrictions, safety, traffic congestion, etc. If needed, subject to prior approval by the Engineer, the Contractor may be able to overcome such obstacles by collecting roughness data during non-peak hours or at night, where speed, traffic, and safety are less of a problem.

The Contractor shall submit the QC plan to perform roughness survey plan to the Engineer no less than 60 days prior to planned commencement of the asphalt concrete wearing course construction. The QC plan shall be prepared in accordance with Appendix to pavement. The contractor shall not commence with the roughness survey without prior approval of the QC plan by the engineer.

All equipment must be operated within manufacturer's specifications. When in doubt regarding roughness measurement data, the Engineer has the right to request additional quality assurance measurements to be performed by the testing company, at the Contractor's cost.

### **310.04.3 Additional Requirements for Collection of Roughness Data**

The following field survey guidelines are recommended for use in addition to the standard practice shown in Appendix to pavement:

- Because roughness data shall be collected in both directions, and on the third lane sections, the Contractor should clearly identify the "inventory direction" for reporting IRI data so that the Owner can use this same data for the appropriate direction for all future IRI surveys.
- Roughness data collection should be performed when the pavement is in stable condition. Data should not be collected during winter (frost/freeze or freeze/thaw) or wet base conditions. Data collection should be performed during good weather conditions when wind conditions will not affect equipment stability and on dry pavement. All recommended procedures of the equipment manufacturer should be observed.
- Data should only be collected at the speeds that correspond to the manufacturer's recommended speed range. Constant speeds should be maintained for all measurements within specified ranges.
- Exclude the impacts of bridge approaches and railroad crossings (or other localized discontinuities) from the roughness measurement for the roadway. Bridge decks should not be included; the objective is to obtain a measure of pavement not bridge roughness.
- Roughness measurements should be taken over the entire length of the roadway section in both lanes, and along the third lane sections, where applicable. However, in order to achieve equipment and speed stability, a minimum run-in length, consistent with the manufacturer's specification, may be required prior to the beginning of the measurement area. If this minimum cannot be met prior to the start of the sample section, a shorter portion of the section may be measured, but noted accordingly so that the same portion can always be measured in future roughness data collection activities by the Owner.

## **310.05. IRI Requirements**

### **310.5.1 IRI Acceptance Criteria**

The asphalt concrete wearing course shall be accepted for all road sections where the IRI is not greater than 2.50 m/km (250 cm/km), and where all other applicable contract requirements are met. The acceptance determination will be made by the Engineer on sections that are no less than one kilometer in length (1 km). The Engineer will use the measurement report provided by the Contractor (via its testing company) for this determination. The Engineer may request the Contractor to perform additional IRI measurements as quality assurance (QA) for verification of certain sections where there may be questions about the quality of the reported IRI results. Such QA measurements shall not exceed ten percent (10%) of the overall QC measurement length. A section where IRI exceeds 250 cm/km will be rejected by the Engineer where each such rejected section shall be no less than one kilometer (1 km) long. The Engineer shall notify the Contractor about the rejected section upon completing the review of the IRI measurement report within 14 days of its submittal by the Contractor.

### **310.05.2 Asphalt Concrete Wearing Course Repairs**

The repair procedures for rejected road sections shall be as follows:

- Within 14 days after receiving the Engineer's notice of rejection, the Contractor shall prepare a repair plan based on the IRI measurement report to remove and replace the asphalt concrete wearing course from the rejected sections. The length of any repair section shall be no less than 50 m. The repair plan shall also address repair schedule, and traffic control and safety.

- No repair work shall commence without prior approval of the repair plan by the Engineer.
- Upon completion of the repairs the Contractor shall re-measure the IRI along all lanes in the rejected and repaired sections.
- This repair process shall continue until all rejected one-kilometer sections meet the IRI acceptance criteria. Any and all repair costs and delays, also including IRI re-measurements, shall be the sole responsibility of the Contractor.

## ***CHAPTER 311. Pavement patching***

### **Description**

#### **311.01. Introduction**

The chapter deals with the repair of potholes and other areas of damaged pavement using asphalt mixture

### **Materials**

#### **311.02. Materials**

The materials to used will be in accordance to the following specifications:

Bitumen Tack Chapter 307  
Coat

Asphalt concrete Chapter 308 and SM STB 1033:2008

### **Executing condition**

#### **311.03. Equipment**

The following equipment is likely to be required:

- a) Electric or gasoline saw able to cut up to 10 cm pavement depth in one operation.
- b) Air compressor. Complete with tools for pavement cutting and movement of debris
- c) Compacting equipment. Vibrator plate or other suitable equipment for small areas. Steel wheel or pneumatic tyred roller for substantial patches.
- d) Bitumen heater Equipment capable of safely heating bitumen tack coat in a controlled manner and applying by pressure spray will be provided according to the article 304.03(c)

#### **311.04. The cutting and removal of degraded materials**

Areas of potholes and otherwise degraded or damaged surface material shall be marked out either by the Engineer or by the Contractor for the Engineer's approval.

Marked areas shall be well defined rectangles with sides parallel and perpendicular to the axis of the road.

The edges of marked areas shall be cut to such a depth as is required for removal of damaged material or to match the depth of potholes and the entire material within the

marked boundary of the patch shall be removed to the full depth. The sides of the cut out area shall be clean vertical faces and the base of the cut area shall be reasonably flat and level such as to require a uniform thickness layer of asphalt to make good.

Material removed shall be taken off the site and disposed of in accordance with the requirements of this Specification.

### **311.05. Tack-coating of the surface**

Before patching the surface of the patch area will be tack-coated according to Chapter 307. Tack coating shall be applied carefully to the base area of the patch and to the vertical sides. Care shall be taken not to spray excess tack coat material outside the boundaries of the patch area.

### **311.06. Pothole patching**

The patch area shall be made good with hot asphalt mix compacted in layers or courses not exceeding 50 mm after compaction. The compaction shall be carefully made. The degree of compaction shall be in accordance with the requirements of Chapter 311.

The asphalt mixture used shall conform to and be compatible with the adjacent pavement structure.

The thickness of the last course shall be a minimum 25 mm. The level after compaction will be no more than 5 mm higher than the existing surface.

### **311.07 Acceptance**

The works will be accepted according to the Technical Specification including Chapter 001.

### **Measurements**

The work volume of work will be measured in tonnes of asphalt placed. The Contractor will be required to maintain careful records of the tonnage of asphalt used and to have those records confirmed and signed by the Engineer's representative on the site on a daily basis. No payment will be made without satisfactory signed records and no payment will be made for asphalt material spoiled or wasted for whatever reason.

### **Payment**

Payment shall be made for the accepted tonnage of asphalt placed in patches at the rate quoted in the Contract for the works under the appropriate Bill item which will include all works required for the successful completion of patches including, but not limited to, preparatory works, cutting out, tackcoating, supply and compaction of asphalt.

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
31101	Pothole patching with asphalt	Tonnes



## ***CHAPTER 312. Making good cracks and joints in the existing pavement***

### **Description**

#### **312.01. Introduction**

These works include the repair of coarse cracks and joints of the existing bituminous pavements and the provision of stress absorbing membrane (SAMI) to finely cracked areas before placing new asphalt layers. These works will be required wherever new asphalt is to be placed over existing cracked asphalt layers unless otherwise directed by the Engineer.

### **Materials**

#### **312.02. Materials**

The materials will be in accordance to the following standards:

Bitumen	SM GOST 22245-90*
Grouting materials (Bituminous mastic)	Shall be based upon the provisions of Table 5.3 VSN 24-88 for Bitumen 60/90 climate zone III,IV. The bitumen and mineral filler contents shall be varied in laboratory tests to yield a material having an E value (Young's Modulus) in the range 1500-3000 MPa. The mix having been determined and approved by the Engineer shall not thereafter be changed without the approval of the Engineer.
Bituminous emulsion	SNiP 3.06.03-85
Geotextile SAMI	for Shall comply with the requirements of Section 602 of this Specification

### **Execution**

#### **312.03. Equipment.**

##### **a) Compressed Air**

Equipment used for the blowing out of cracks and joints, before sealing with bituminous mastic. Minimum requirement for one set of cleaning equipment: 500 cfm compressor delivering air heated to range 140 – 170 deg C at the road surface through blast nozzle. Equipment to be demonstrated and approved by Engineer before use.

##### **b) Equipment used to inject the asphalt mastic.**

A crack sealant applicator attached to a heated hose that is attached to an indirectly heated sealant chamber is required. The sealant chamber may require pressurisation to assist mastic injection. The mastic heater is to be equipped with a thermo-control system

to keep the mastic temperature within the limits indicated by the supplier or directed by the Engineer. Application temperatures are likely to be in the region of 150 deg.C.

**c) Bitumen Heater/Distributor**

An approved bitumen heater using indirect heating, comprising heater unit supplying oil filled heating coils or other approved system. Automatic temperature control of bitumen at any point in the range 100 – 200 deg C. Clearly visible thermometer for checking bitumen temperature, operating range 100 -250°C and graduations of 5°C. Pump supplying hand sprayer for detail work and adjustable spray bar for bulk work. Fully adjustable delivery rates.

**312.04. Cleaning and sealing of major cracks.**

Before commencing pavement works, the Engineer and Contractor shall jointly inspect and record the location of existing defects in the surface of any parts of the pavement to be overlaid. This record should be sufficiently accurate to allow SAMI layers, if required, to be correctly placed on subsequent overlay layers.

The Engineer will indicate those cracks which are to be cleaned and sealed. In principle all cracks with a visible width of 4mm or greater shall be cleaned and sealed

The surface in the area of the cracks to be treated shall first be thoroughly cleaned by air blast and brushing.

Cleaning and sealing shall be done using a hot air blast and Bituminous Mastic infill. The hot air blast nozzle shall be kept moving at all times to avoid burning of the existing asphalt. Cracks shall be opened out to a depth of at least 80mm or such other depth as may be directed. Greater depths will only normally be directed if there is visible crack penetration greater than 80mm after the initial cleaning. The bituminous mastic, at the temperature indicated by the supplier or directed by the Engineer, will be injected as soon as possible after hot air blast cleaning and in no circumstances more than 5 minutes later than the hot air was used. Mastic must be injected whilst the cleaned asphalt crack is still hot from the cleaning process.

If the Contractor desires, a preliminary cleaning and routing of cracks may be carried out using high pressure water jetting. Cracks cleaned in this manner shall be left until they are free of water and the area surface dry and shall then be subject to secondary cleaning and drying using heated compressed air as above. It is important that cracks be both hot and dry when mastic is injected.

Bituminous mastic will be injected working along the crack to the full depth cleaned and in such a manner that the finished surface of the injected mastic is clearly above the existing surface level. Immediately after injection, the mastic will be screeded and smoothed to the same level as the existing pavement. Excess mastic shall be spread on the surface of the adjacent asphalt to form a band of sealed material along the line of the crack about 100mm in width.

**312.05. Defective cracks and joints.**

Clean and reseal any sealed cracks which exhibit signs of renewed cracking.

**312.06. Works acceptance.**

The works will be accepted on completion, subject to compliance with the Specifications in respect of materials and workmanship.

**312.07. Application of SAMI layer.**

SAMI layer shall comprise an intermediate layer between the new overlay and the old asphalt consisting of a layer of geotextile complying with Type 3 requirements of chapter 602 of this Specification laid into a heavy bituminous tack coat.

The SAMI layer shall be applied immediately before the first layer of asphalt overlay is put down. No traffic shall be allowed on the surface of the SAMI layer other than essential construction traffic.

The paver to be used for spreading overlay over areas with SAMI layer shall be a track type paver, not a wheeled paver.

Prior to the application of a SAMI layer, the area(s) to which the layer is to be applied shall be indicated by the Engineer.

The surface on which the paving fabric is to be placed shall be free of dirt, water, vegetation and other foreign materials. Any crack sealing procedure for cracks in excess of 4mm (as described above) within the area of the SAMI layer shall have been completed before application of SAMI Layer. The use of a levelling course may be required prior to placing the paving fabric in severe cases.

The bitumen distributor must be suitably metered and capable of spraying the bitumen uniformly and at the prescribed application rate. No drilling or skipping shall be permitted.

The fabric handling equipment shall comprise a tractor or similar mechanical device, with mounted lay-down equipment that is capable of handling full rolls of fabric. The equipment shall be capable of laying the paving fabric smoothly without excessive wrinkles and/or folds.

Stiff bristle brooms used to smooth, and scissors (or blades) used to cut the paving fabric shall be provided by the Installer. A pneumatic-tired roller may be needed in some cases to smooth paving fabric into the asphalt cement.

The asphalt cement and binder must be uniformly spray-applied at the specified rate. The quantity required may vary with the surface condition of the existing pavement (i.e. degree of porosity), but shall be applied at a nominal rate of 1.2 l/m<sup>2</sup> of residual bitumen. Application of asphalt cement will be performed by truck-mounted distribution equipment whenever possible, with hand spraying kept to a minimum. The temperature of the bitumen must be sufficiently high to permit a uniform spray pattern. The minimum recommended temperature for asphalt cement is 140°C, and should not exceed 160°C at the contact surface.

The paving fabric shall be placed onto the asphalt cement with a minimum of wrinkles before the asphalt can cool or lose its tackiness. The paving fabric shall be placed so that the non-heat treated (bearded or fuzzy) side is placed downward, into the sealant, thus providing optimum bond between fabric and pavement during the construction process. As directed by the Engineer, wrinkles severe enough to cause "folds" shall be slit and laid flat in the direction of paving operations. Brooming the paving fabric will assist it in making intimate contact with the pavement surface. Any overlap of the paving fabric should be minimized, although an overlap of 3 to 10 cm is recommended to insure full closure of overlapping layers. Transverse joints should be shingled (overlapped) in the direction of paving operations to prevent edge pick-up by the paver. In the event that asphalt cement should bleed through the paving fabric before the hot mix asphalt is placed, it may be necessary to absorb any visible sealant by spreading sand or hot mix asphalt over those areas. This should minimize the tendency for construction equipment tires to lift the paving fabric when driving over it. Turning of paving equipment and other vehicles on the paving fabric must be kept to a minimum to avoid movement or damage to the fabric.

Laying of the overlay shall take place not more than 4 hours after the SAMI layer is put down.

### **312.08. Defective application.**

In the event that any area of SAMI layer is found to be defective, by failure to adhere, or because of excess of bitumen, or for any other reason, that area shall be condemned and the Contractor shall remove it and replace with a satisfactory SAMI application at his own cost. Removal shall be by careful heating and scraping to remove the defective layer and thoroughly expose the old asphalt surface. As far as possible all traces of the fresh bitumen application shall be removed before recommencing the SAMI application.

### **312.09. Works acceptance.**

The works will be accepted according to the Technical Specification including Chapter 001.

#### **Measurement**

The sealing of Cracks >4mm is measured in linear meters.

The application of SAMI layer is measured in square metres of surface directed to be covered and actually covered..

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
31201	Cleaning and sealing of cracks >4mm	Linear metre
31202	Provide Sami Layer to cracked areas of existing asphalt pavement	Square metre.

## ***Chapter 313. Concrete Pavement Joints***

### **Description**

#### **313.01. Introduction**

The chapter deals with the cleaning and repair of concrete pavement joints and the sealing of repaired and new joints.

### **Materials**

### 313.02. Materials

The materials to be used will be in accordance with the requirements of this specification and with those of VSN 24-88 and VSN 139-80.

Epoxy Mortar

Cement  
concrete Mortar

Epoxy concrete  
bonding  
materials

Bitumen based  
sealant

#### Executing condition

### 313.03. Equipment

The following equipment is likely to be required:

- a) **High pressure water jetting equipment**
- b) **Air compressor.** Complete with tools for pavement cutting and movement of debris and hot air blasting
- c) **Mortar mixer**
- d) **Sealant heater and dispenser**

### 313.04. Cleaning old Joints

All joints in the existing pavement, excepting areas to be removed and replaced, shall be thoroughly cleaned by high pressure water jet and air blasting.

The exposed surfaces when cleaning is complete shall be fresh sound concrete.

### 313.05. Repairs to Joints

Wherever the joints, as exposed by the cleaning process, exceed 40mm in width or such other width or condition as may be directed by the Engineer, they shall be repaired.

The Contractor shall formulate his proposed working method and materials for joint repair and submit to the Engineer for comment and approval. The working method shall be such as to meet the following requirements and provide clean sound repaired joints able to meet the existing traffic loadings and conditions.

The process of repair shall be such as to provide a sealable groove measuring 20mm in width by 20mm in depth and as straight as may be practicable whilst still conforming to the underlying joint plane. Repairs shall be carried out on one or both sides of the joint as appropriate to meet this requirement.

Below 20mm in depth, where the underlying joint plane has been opened by the cleaning process, the joint shall be filled with approved, non-degradable, compressible joint filler material for a thickness of 20mm or for the thickness of the

open joint plane whichever is the lesser.

Where the open joint plane at depths greater than 20mm is appreciably wider than 20mm the repair shall be extended downwards as far as practicable to provide the maximum support for the repaired upper joint edge(s).

In the absence of acceptable alternative proposals from the Contractor, joints shall be repaired by cleaning the exposed concrete faces to which repair material must adhere, priming with an approved epoxy concrete adhesive and applying approved epoxy mortar to build up the damaged area to the required profile. The required joint groove shall be formed with the use of an appropriate former of steel or plastic, suitable treated to prevent adhesion of the repair mortar

### **313.06. Sealing Joints**

Joint sealing shall be carried out with an approved proprietary joint sealant applied in accordance with the manufacturers instructions. Where the manufacturer recommends the application of a primer to the bare concrete, such primer shall be of a type acceptable to the manufacturer and shall be applied in accordance with his instructions. In all cases sealer and primer shall be applied to freshly cleaned, dust and moisture free surfaces.

Joint sealing shall be carried out on existing and newly repaired joints and on joints in new construction.

#### **Measurement**

The works executed under this chapter shall be measured under three heads. The cleaning of existing joints shall be measured by the linear metre of joint instructed to be cleaned; the repair of existing joints shall be measured by the linear metre of joint instructed to be repaired and the sealing of joints shall be measured by the linear metres of joint, old, repaired and new, instructed to be sealed.

#### **Payment**

Payment shall be made for the accepted linear metres of each of the items below at the rates quoted in the Contract. The works under these items include all works required for the successful cleaning, repairing and sealing of joints including, but not limited to, preparatory works, cleaning by whatever means are required, cutting out, epoxy concrete adhesive, epoxy and cement mortars, joint forming, supply and application of joint primer, if required, and supply and application of joint sealer. The rate for sealing shall include for cleaning prior to application of sealer and/or primer.

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
31301	Cleaning existing joints in concrete pavement	Linear metre
31302	Repair of existing joints in concrete pavement	Linear metre
31303	Joint sealing in concrete pavement	Linear metre

## **CHAPTER 314. SIMPLE BITUMINOUS TREATMENTS**

### **Description**

#### **314.01. Introduction**

This chapter covers the application of one or more coats of surface dressing, each coat consisting of a layer of bituminous binder sprayed on a base prepared previously, followed by a cover of stone chippings properly rolled to form a wearing course to the requirements of these Specifications.

A single surface dressing means an application of bituminous binder to the road surface followed immediately by a single layer of uniform sized chippings.

A multiple surface dressing means two or more surface dressings placed one on the other.

Surface dressings may be placed upon bases of asphalt, concrete or primed granular base material.

### **Materials**

#### **314.02. Materials**

The materials used for bituminous surface treatments will meet the requirements of SNIP306.03-85. Bitumen shall also meet the requirements of chapter 011 of this Specification.

### **Execution**

#### **314.03. Execution of the works**

The bituminous treatment will be executed on the surface of the support course, which is cleaned and dry and dust free. , Bitumen shall either be straight run penetration grade bitumen (80-100 or other approved) or cutback bitumen. Cutback shall either be purpose manufactured cutback or shall be prepared by blending penetration grade bitumen with diesel or a diesel/kerosene blend. The type of bitumen used and the spraying temperature shall depend on the surface temperature of the support surface at the time of application and shall be determined in accordance with the recommendations of British Transport & Road Research Laboratory Overseas Road Note 3 - " A Guide to Surface Dressing in Tropical and Sub-Tropical Countries" - hereinafter referred to as ORN 3.

Chippings for surface dressing shall be in accordance with the size(s) quoted in the Bill of Quantities and the gradings for those sizes and other required properties given in ORN 3.

Rates of spread of binder and chippings shall be in accordance with the recommendations of ORN 3. The rates of spread shall be determined by the Contractor and approved by the Engineer following acceptance tests as described in 309.04 below.

Chippings shall be applied to the sprayed binder immediately after spraying and before the binder has had the opportunity to cool.

Binder shall be applied using an approved pressure distributor complying with the requirements of chapter 307.

Chippings shall be applied using a self propelled chipping spreader having a metering system capable of delivering the design rate of spread of chippings at the same travel speed as required by the distributor for spraying the design spray rate of bitumen.

During the first 3 days after putting the newly constructed surface treatment into service, the Contractor will set traffic speed limits, at max. 40 km/h, on the full width of the carriageway and shall take such measures as may be required to ensure that this limit is obeyed. Measures to be taken may include the operation of vehicles within the traffic stream to slow the stream to the required limit.

#### **314.04. Testing**

Prior to undertaking permanent works the Contractor shall complete test stretches to satisfy the Engineer that the equipment proposed is capable of applying binder and chippings at the required rates of spread and of coordinating the application to produce an acceptable surface treatment.

During the course of the works regular tests will be made to confirm

- the quality of binder (all test specified and implied in this Specification and in ORN 3)
- the quality of chippings (hardness, grading, density, absorption, shape factors)
- rates of spread of bitumen and chippings every 300metres of lane length but not less than 4 sets of tests per working day.

#### **314.05. Works acceptance.**

The acceptance of the treatments will take according to the Chapter 001, under the condition of their execution in compliance with the provision of SNIP 306.03-85, Project Specifications and Engineer's approval.

#### **Measurements**

The simple bituminous treatments will be measured in litres of bitumen and tonnes of chippings required for the treatment of those areas directed to be surface dressed. Payable amounts will be based on the authorised rates of spread confirmed by the regular tests on rates of spread. If the tests show that the actual spread rates are less than those authorised but still acceptable then payment shall be based on the actual rates as determined by testing.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

No.	Item	Unit of Measure
31401	Application of Bituminous Binder for surface dressing	Litres
31402	Application of Chippings (state sizes) for surface dressing	Tonnes



## **APPENDIX TO PAVEMENT - : Determination of International Roughness Index (IRI) to Quantify Pavement Roughness in Moldova**

### ***1. SCOPE***

- 1.1. This practice describes a method for estimating roughness for a pavement section. Generally, an International Roughness Index (IRI) statistic is calculated from a single longitudinal profile measured with a road profiler in both the inside and outside wheelpaths of the pavement. The average of these two IRI statistics is reported as the roughness of the pavement section. However, for Quality Control (QC) purposes used in this contract for acceptance of the newly constructed asphalt concrete wearing course, only a single measurement is necessary for each lane to coincide with the respective wheelpaths.
- 1.2. The practice recognizes the need for a QC plan and proposes guidelines for the development of such QC plan.
- 1.3. Measurements of profile are made in accordance with ASTM E 950. If any part of this practice is in conflict with its references made, such as ASTM standards, this practice takes precedence for its purpose.
- 1.4. This practice does not purport to address all of the safety issues, if any, associated with its use. It is the responsibility of the Contractor to establish appropriate safety and health practices and determine the applicability of regulatory limitations related to and prior to its use.

### ***2. REFERENCED DOCUMENTS***

This Appendix is based on AASHTO Designation: PP 37-04 as modified for Moldova. Its main references are the following *ASTM Standards*:

- ASTM E 867, Terminology Relating to Vehicle-Pavement Systems
- ASTM E 950, Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference

### ***3. SIGNIFICANCE AND USE***

3.1. This practice outlines standard procedures for measuring longitudinal profile and calculating the International Roughness Index (IRI) for highway pavement surfaces to help produce consistent estimations of IRI for network-level pavement management.

### ***4. TERMINOLOGY***

4.1. *roughness*—according to ASTM E 867, the deviation of a surface from a true planar surface with characteristic dimensions that affect vehicle dynamics and ride quality. In this practice, the term roughness is the average of two IRI statistics calculated from longitudinal profile measurements, one in each pavement wheelpath. However, if the measurement is performed on newly constructed asphalt concrete wearing course where (not yet opened to traffic) a single measurement in the wheelpath may be adequate in each lane.

4.2. *longitudinal profile*—the set of perpendicular deviations of the pavement surface from an established horizontal reference plane taken along a travel lane.

4.3. *international roughness index (IRI)*—a statistic used to estimate the amount of roughness in a measured longitudinal profile. The IRI is computed from a single longitudinal profile using a quarter-car simulation, or according to other acceptable methodology and computer programs which are internationally known standards to calculate the IRI statistic from a longitudinal profile.

## **5. QUALITY CONTROL**

5.1. The Contractor using this practice is required to develop a QC plan satisfactory to the Engineer. At a minimum, the plan shall include the requirements listed in the following sections.

5.1.1. Qualification and training records of individuals conducting the survey;

5.1.2. Accuracy and calibration records of equipment used in the survey; and

5.1.3. Survey schedule.

5.1.4. Report submittal date.

## **6. DATA COLLECTION**

6.1. The Contractor, in the QC plan, is expected to designate the lane(s) and direction(s) of travel to be surveyed based on sound engineering principles and in consultation with the Engineer.

6.2. Locate (place) one sensor in the middle of the rear axle between the wheelpaths or the two sensors, separated approximately 147 cm to 180 cm in the wheelpaths. The longitudinal profile points used for calculating the IRI shall have a longitudinal spacing not greater than 15 cm. Long wavelength filters are used to remove all wavelengths exceeding 100 m.

**Note** — The use of anti-aliasing filters and averaging to remove small wavelength content from the profile is left to the discretion of the testing firm based on equipment manufacturers recommendations.

## **7. CALCULATIONS**

7.1. Calculate IRI values for each 100 m for each lane.

## **8. REPORT**

8.1. Report the roughness calculated in Section 7.1 to the nearest 1 centimeter per kilometer (1 cm/km). This does not preclude more accurate recording of the IRI.

8.2. Use the length of the data summary intervals of 100 m.

8.3. *The minimum data recorded and stored for each section shall include:*

8.3.1. *Section Identification*—List all available information necessary to locate the section using Owner's current referencing system;

8.3.2. IRI for each lane in the wheelpaths (cm/km);

8.3.3. Date of data collection (month/day/year);

8.3.4. Length of section in meter for which the data is collected.

8.3.5. Profile sampling interval;

8.3.6. Long wavelength filter setting; and

8.3.7. Pavement surface temperature.

## 4. BRIDGES AND OVERPASSES

### CHAPTER 401. REPAIRS TO THE INFRASTRUCTURE AND SUPERSTRUCTURE

#### Description

##### 401.01. Introduction

The works described in this chapter cover the minor repair and restoration of elements of the infrastructure and superstructures and comprise:

- consolidation of piers with minor deteriorations,
- execution of works on the superstructure beam joints,
- repair works of the infrastructure elevation,
- painting works of the visible surfaces of the infrastructure and superstructures.

The minor repair works include the restoration of sections of the abutments, piers and superstructures to comply with the design requirements by repairing faillores of the concrete, of cracks, of exposed reinforcing bars and of spalling in the concrete, by filling in the cracks and fissures of the elements.

#### Materials

##### 401.02. Materials

The materials used for the works described in this chapter shall be in accordance with the following requirements:

Mortar with polymer	SNiP 3.06.04-91
Concrete with polymer	SNiP 3.06.04-91
Concrete	SM GOST 26633-91**, Drawings and SNiP 3.06.04-91
Sand cement mortar with additives	SM GOST 26804-86
Reinforcement and built in elements.	Project, SM GOST 5781-82*****
Bituminous Mastic	VSN 32-81

#### Working conditions

##### 401.03. Equipment

The following items of equipment and special auxiliary installation are likely to be needed:

- 1 Motocrane for assembly and dismantling of the auxiliary installation;
- 2 Compressor for pneumatic hammer, cleaning /drying cracks;
- 3 Concrete pumping equipment
- 4 Deep vibrator for concrete compaction;
- 5 Injection concrete equipment, metallic brush or sanding equipment for the concrete and reinforcement steel cleaning;
- 6 Temporary scaffoldings, auxiliary piers, lifting equipment for repair works.

##### 401.04. Repair Works (Plaster), Run of Slope, Beam Joints.

The repair works will be executed with mortar of cement and sand of 2-3 cm thickness on the piers elevation and on the abutment, according to SNiP 3.06.04-91. The jointing of deck beams and the consolidation of pier piles will be executed with reinforced concrete after abrading and cleaning concrete and reinforcing bars according to the Project, and SNiP 3.06.04-91. On completion of the works under this section, surfaces of the piers, elevation, of the abutment and faces of the outer deck beams will be painted with a liquid suspension of cement with polymers, to obtain an improved, uniform appearance.

The works will be carried out only in dry and reasonably warm weather, the temperature being higher than 5° C at all times.

##### 401.05. Cleaning and filling of cracks

Cracks will be cleaned and dried using water jets and blowing equipment the cracks.

##### 401.06. Consolidation of reinforced concrete piles.

The works shall be executed after cleaning the river bed beneath the bridge and shall include excavation of the soil around the pile to the required depth, the placing of

consolidation works of reinforced concrete cast-in-situ, waterproofing works by applying of two layers of mastic with a brush, soil back-filling and compaction works in layers of 15 cm thickness. The excavation and waterproofing works are described in the relevant sections. Reinforcement and concrete work shall be executed in accordance with the requirements of SNiP 3.06.04-91.

#### **401.07. Work acceptance**

Works acceptance will be in accordance with paragraph 001, provided they are executed in compliance with SNiP 3.06.04-91, Project, with these Technical Specification and approved by the Engineer.

#### **Measurement**

The minor repair, consolidation, jointing and slope execution works described in this chapter will be measured in cubic meters of reinforced concrete or reinforced concrete with polymers, or mortar with polymers, or sand cement mortar. Repair works and painting works will be measured in square meters of the surface covered with sand cement mortar or with liquid suspension of cement with polymers .

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Items of payment</b>	<b>Unit of measure</b>
40101	Minor repair of the infrastructure and superstructures using reinforced concrete	cubic metre
40102	Minor repair of the infrastructure and superstructure elements using concrete with polymers	cubic meter
40103	Minor repair of the infrastructure and superstructure using mortar with polymer	cubic metre
40104	Repairs to the pier and abutment elevation using cement and sand mortar	square metre
40105	Consolidation of piles with reinforced concrete	cubic metre
40106	Jointing of superstructure beams	cubic metre
40107	Painting of the visible surfaces of the infrastructure and superstructure elements using liquid Suspension of cement with polymers	square metre
40109	Piles factory manufacture, transporting and installation on the site	cubic meter
40110	Production and installation of reinforced concrete girders	number
40111	Hand drilling in reinforced concrete	lin. meter
40112	Production and installation of steel parts and armature	kg

## **CHAPTER 402. PILE PIERS, PILE ABUTMENTS AND RETAINING/PROTECTION WALLS**

### **Description**

#### **402.01. Introduction**

The works include bridge piers and abutments and piers and abutments repair work to existing bridges. The piers and abutments in question consists of driven reinforced concrete piles made rigid by connecting the pile tops with a collar beam of reinforced concrete. Behind the abutment there is a retaining/protection wall of pre-cast reinforced concrete blocks which retains the road embankment. The abutment is prolonged in the form of wings to retain the embankment slopes. The works for the new piers and abutments include: procurement of materials, piles manufacturing, transporting and driving, mounting of the collar beam blocks, execution of concrete seating bearing parts on collar beams, provision of waterproofing to buried surfaces. Piers and abutment repairs will consist of partially dismantling and rising them where it is necessary rehabilitation of the retaining wall in the wing area which has disintegrated as a result of washout. The works will be executed according to the Project, Designs type 3.503.1-79 and 3.503.1-75.

### **Materials**

#### **402.02. Materials**

The materials, pre-cast elements, and other items used in these works shall be in accordance with the following:

Concrete and components	Technical specifications SM GOST 26633-91** SNiP 3.06.04-91
Sand Cement Mortar	Technical specifications, SM GOST 28013-98**, SNiP 3.06 04-91
Pre-cast reinforced concrete with a cross-section of 0,35x0,35m	Technical specifications, Designs type 3.501-86
Reinforced Concrete Blocks for the collar beam	Technical specifications, SNiP 3.06.04-91
Reinforced Concrete blocks for the retaining wall	Technical specifications, SNiP 3.06.04-91
Reinforcing bars and built-in elements	Technical specifications, Designs type 3.501.1-79, SNiP 3.06.04-91
Crushed stone for the foundation of the retaining wall	SM GOST 8267-93***
Treatment with bitumen for waterproofing	VSN 32-81
Bitumunous Mastic for waterproofing	VSN 32-81

### **Working Conditions**

#### **402.03. General requirements.**

The works shall be in accordance to the technical specification and SNiP 3.06.04 - 91.

#### **402.04. Equipment..**

The following equipment is likely to be required

- 1 Pile driving machine, for piles with a length up to 12,0 m;
- 2 Motocrane, for servicing the pile driving machine and mounting the blocks of weight up to 5t.;
3. Welding Compressor, for welding works;
- 4 Equipment for injection in joints and cracks;
- 5 Vibrator for concrete compaction in joints between piers and abutments elements, in bearing parts;

#### **402.05. Piles**

Pile driving shall be done to the designed refusal, such that the end of the pile is no higher than the indicated level in the technical specification. Cutting the top of the pile to length shall be done according to the Technical Specification and the Design type 503.1-79.

#### **402.06. Jointing of the abutment blocks and the retaining wall.**

	Jointing of abutment blocks and retaining wall shall be carried out in accordance with the following:		
	1.	Blocks of the collar beam with the piles	According to Design type 3.503.1-79
	2.	Blocks of the collar beam	According to Design type 3.503.1-79
	3.	The blocks of the new retaining walls and blocks of the existing wall	According to Design type 3.503.1-75
	4.	Welding works are to be executed according to:	Technical Specification and SNiPs 3.03.01-87 and 3.06.04-91

#### **402.07. The Retaining Wall**

While erecting the retaining wall, the blocks are to be viably fixed with the piles. The joints between blocks of the retaining wall will be filled with sand cement mortar through the whole depth. The retaining wall repair works include excavation of the slope soil, backfilling and compaction works.

#### **402.08. Casting and curing of Concrete and mortar**

Casting and curing of concrete and mortar shall be carried out in accordance with SNiP 3.06.04-91, Design type 3.503.1-79 and 3.503.1-75

#### **402.09. Waterproofing**

Waterproofing shall be carried out in accordance with SNiP 3.04.03-85 CPE .04.03-2005 and VSN 32-81. The buried surfaces of the abutment shall be waterproofed with two layers of bitumen of binding waterproofing type. Waterproofing shall only be applied to surfaces which have been carefully cleaned and are dry and free from grease, mud and dust

Waterproofing shall only be carried out whilst air temperatures are above 5°C.

#### **402.10. Works acceptance**

The works for the abutments on piles and for the supporting walls will be accepted when shown to be in accordance to the technical specification, SNiP 3.06.04-91, VSN 32-81 and when approved by the Engineer.

#### **Measurement**

The works will be measured in cubic meters of reinforced concrete for each type of element as listed in the schedule of pay items below. No other measurements shall be made for the purposes of payment.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of Measure</b>
40201	Execution of the piers and abutments of pre-cast reinforced concrete piles and blocks of the collar beams with bearing parts	cubic meter
40202	Execution of the retaining wall of pre-cast reinforced concrete elements	cubic meter
40203	Repair works to reinforced concrete retaining wall	cubic meter

## CHAPTER 403. REPAIR OF ABUTMENTS WING WALLS

### Description

#### 403.01. Introduction

The works described in this chapter cover the repair and overbuilding building of reinforced concrete wings on a direct foundation at the existing bridges, with extension of the abutment in the embankment slope area, as well as reinforced concrete wings to the safety walls on the collar beams of the abutment. The wings are to be executed according to the Technical Specification and to SNiP 3.06.04-91.

### Materials

#### 403.02. Materials

Materials and the pre-cast elements must comply with the following requirements.

Concrete and components	Technical Specification, SM GOST 26633-91** SNiP 3.06.04-91
Crushed stone for the foundation bed of the abutment wing wall	SM GOST 8267-93***
Reinforcement and built-in elements	Technical Specification, SM GOST 5781-82****, SNiP 3.06.04-91
Bitument treatment for waterproofing	VSN 32-81
Bitumunous Mastic for waterproofing	VSN 32-81

### Working conditions

#### 403.03. General conditions.

The execution of these works at the abutment shall be executed in compliance with SNiP 3.06.04-91.

#### 403.04. Equipment.

The following equipment is likely to be required:

- 1 Crane for the assembly and dismantling of formwork, installation of the reinforcing grid and supply of concrete using a bucket ;
- 2 Excavator, for the excavation of the foundation;
- 3 Welding equipment for welding works;
- 4 Vibrators for compaction of the concrete cast-in-situ;
- 5 Pump, for pumping the water from the foundation excavation

#### 403.05. Excavation works for the execution of the abutment wing walls

The excavation works for the foundation of the abutment wing walls and the removal of soil to repair and overbuild the wing walls and execution of the wing wall, as well as backfilling after execution and waterproofing of the wing walls shall be executed in accordance with the provisions of Chapter 203.



#### **403.06. Formwork**

Formwork shall comply with the requirements of SNiP 3.06.04-91.

#### **403.07. Steel Reinforcement**

Reinforcing works are to be carried out according to SNiP 3.06.04-91. No reinforcement shall be brought on to the site or used without a manufacture certificate certifying that it complies with requirements. Any change or substitution in the category class, diameter, or type of the steel, required by the Technical Specification must be agreed by the Engineer.

Before use, all reinforcement must be cleaned of rust, mud, dust and grease, Lap joints of reinforcing bars are to be executed by overlapping by a length of at least 30 bar diameters and in compliance with requirements of the Technical Specification.

Where the welding of reinforcement and built-in elements is unavoidable the work shall be executed in accordance with the requirements of SM GOST 14098-91. Welding of reinforcement shall be avoided wherever possible and shall not be carried out without the explicit permission of the Engineer.

#### **403.08. Concrete Casting Works**

Concrete mixing, transportation and casting, as well as concrete curing works are to be carried out in accordance with the requirements of this Specification, SM GOST 26633-91\*\* and SNiP 3.06.04-91.

No concrete mixture which has lost its required workability shall be used. It is not permissible to improve the concrete workability by adding additional water into the mixed concrete.

Any defects on exposed surfaces after removing formwork will be made good by smoothing with sand cement mortar if the Engineer approves. If the defect is too serious for such approval the Contractor shall remove the defective work and replace it at his own cost.

#### **403.09. Waterproofing**

Waterproofing works are to be carried out in accordance with the provisions of paragraph 402.09

#### **403.10. Acceptance of works**

The works will be accepted in accordance with the provisions of chapter 001 provided they are in accordance with this Specification, SNiP 3.06.04-91 and are to the satisfaction of the Engineer.

##### **Measurement**

The works will be measured in cubic meters of reinforced concrete for each type of element as listed in the schedule of pay items below. No other measurements shall be made for the purposes of payment.

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

**Item**

**Unit of measure**

40301	Execution of the slope wing wall at the abutment	cubic metre
40302	Consolidation of the slope wing wall at the abutment	cubic metre
40303	Overbuilding of the slope wing wall at the abutment	cubic metre
40304	Execution of the wing wall on the reinforced concrete collar beam	cubic metre
40305	Repair works of the reinforced concrete wing wall at the abutment	cubic metre

## **CHAPTER 404. SUPERSTRUCTURE: SPANS 3,90, 4,80, 8,66, 11,36 M**

### **Description**

#### **404.01. Introduction**

The works described in this chapter cover the replacement of reinforced concrete existing bridges decks with a spans of 3,90, 4,80, 8,66, 11,36 m. The works consist of manufacturing, transporting, handling, erection of deck beams and their jointing. The work of demolishing bridge elements and dismantling of the existing reinforced concrete slab decks of 3,90, 4,80, 8,66, 11,36 m span do not form part of this chapter and are included in chapter 418. The work of waterproofing new bridge decks is covered in chapter 408.

### **Materials**

#### **404.02. Materials**

All materials and pre-cast elements used for the works of this chapter must comply with:

Concrete and components	Technical Specification, SM GOST 26633-91** and SNiP 3.06.04-91
Sand Cement Mortar	Technical Specification, SM GOST 28013-98** and SNiP 3.06.04-91
Reinforcing bars and built-in elements	Technical Specification ,SNiP 3.06.04-91
Reinforced concrete beams with ribbed bars for the superstructure	Technical Specification SNiP 3.06.04-91
Bituminous felt in rolls	SNiP 3.06.04-91

Working conditions

#### **404.03. Equipment**

The following equipment will be required:

- 1 Crane for the mounting of deck beams weight p to 12 tons. ;
- 2 Welding equipment for welding works;

#### **404.04. Mounting the deck beams**

Execution of the pre-cast reinforced concrete beams, acceptance of the executed items, and their transporting and erection are to be carried out in compliance with the requirements of the Technical Specification and SNiP 3.06.04-91. The slabs for the superstructure are to be mounted on a reinforced concrete bearing platform with reinforced rubber bearings pads , Beams jointing has to be done in compliance with the Technical Specification.

Traffic shall not be permitted on bridge deck elements until the jointing concrete has reached 70% of its design strength.

#### **404.05. Concrete Casting and Curing of joints**

Concrete Casting and Curing at the joints will be done as described in the paragraphs 403.08.

#### **404.06. Works acceptance**

Acceptance of the works of this chapter shall be in compliance with chapter 001 provided the works have been executed in accordance with the requirements of SNiP 3.06.04-91 and the Specifications and are approved by the Engineer.

##### **Measurement**

The works for replacing slabs of existing bridge decks will be measured as the total cubic meters of precast reinforced concrete and of cast-in situ concrete required to be placed in the works. The work of actually placing the new slabs in position will be measured by the number of slabs placed.

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter and shall be the full payment due in respect of all works required to provide the bridge deck elements in place, mounted and jointed.

Payment will be made under the following items:

<b>Item</b>	<b>Unit of measure</b>
40401 Execution of brdge deck of 3,90, 4,80, 8,66, 11,36 m span and bearing platform	Cubic metre

### **CHAPTER 405. CONSTRUCTION OF APPROACH SLABS**

#### **Description**

#### **405.01. Introduction**

The work in this chapter covers the construction of approach slabs to existing bridges. Works will be carried out on the basis of the Technical Specification and the Design type 3.501-41 and include the demolition and removal of existing slabs and bearing beams, provision of crushed stone bed to the new bearing beam, the provision and placement of new bearing beams and approach slab elements and waterproofing.

When the area has been cleared, the damaged/eroded embankment will be made good with approved backfill material and the bearing beams and approach slabs

constructed and waterproofed.

## **Materials**

### **405.02. Materials**

Materials, precast units and elements for the works of this chapter must comply with the following requirements:

Concrete and components	Technical Specification, SM GOST 26633-91**, SNiP 3.06.04-91
Crushed stone for the bed of the bearing beam	SM GOST 8267-93***
Reinforcement	Project-tip 3.503.-41
Bitumen treatment for waterproofing	VSN 32-81
Bituminous mastic for waterproofing	VSN 32-81
Reinforced concrete slabs of the bearing beam	Design type 3.503.-41
Reinforced concrete approach slab	Technical Specification, Project-tip 3.503-41
Approved Backfill	SM GOST 23735-79* and Chapter 406

## **Working conditions**

### **405.03. General**

The works in this chapter will not be executed until completion of any works required under the provision of chapter 406. Execution and repair works to bridge approach slabs shall be carried out in compliance with SNiP 3.06.04-91 and Design type 3.503-41.

### **405.04. Equipment**

The following equipment will be required:

- 1 Crane for the mounting of PC units, weight up to 4 tons. ;
- 2 Vibrators for compaction of the concrete cast-in-situ;

### **405.05. Crushed stone bed for the bearing beam**

The bed will be executed of graded crushed stone to achieve an interlock according to SNiP 3.06.03-85, and the Design type 3.503-41.

### **405.06. Installation of Bearing Beams and Approach slabs**

The installation of the approach slabs on to the bearing beam and the abutment shall be done in compliance with Drawing 3.503-41. Trafficking on top of the approach slab after execution of these works is allowable only when the strength of insitu concrete achieves 70 percent of the designed strength.

### **405.07. Casting and curing of concrete at the approach to bridges**

Casting and curing of concrete at the approach to bridges shall be in compliance with paragraph 403.08 and 403.09.

#### **405.08. Waterproofing**

The surface of the approach slabs and of the bearing beams on their conjunction with the embankment must be waterproofed. The works must be executed as described in the paragraphs 402.09.

#### **405.09. Acceptance of work**

The acceptance and repair works of the approach to the bridge shall be in accordance with the requirements of chapter 001. The works shall comply with the Technical Specification, Design type 3.503-41, SNiP 3.06.04-91 and 3.09.01-85.

##### **Measurements**

The Works under this chapter shall be measured for payment only as the square metres of approach slab affected, measured on the surface of the approach slabs. No separate payment shall be made for the works of excavation and backfilling but the work of replacing road pavement shall be paid under the appropriate items of Chapter 3 based on the area derived by multiplying the road pavement width by a length equal to the distance from the rear of the abutment wall to the back face of the bearing beam plus the depth from the underside of the crushed stone pad to the finished road level.

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>Item.</b>	<b>Unit of measure</b>
40502      Provision of approach slabs at existing bridges, length 4 metres	square metre

### **CHAPTER 406. REPAIRS TO ABUTMENT EARTHWORKS (CONES)**

#### **Description**

##### **406.01. Description**

The work in this chapter includes providing backfill to gaps behind abutments and wingwalls and reinstating the correct shape of the conical and semiconical slopes at open abutments using selected, granular, approved free draining soil.

Additionally works include the reshaping of washed out stream and waterway banks by excavation and by placing and compacting fill of normal soil.

These works include excavation of soil, transporting, stockpiling, unloading, spreading, grading, compaction and finishing works. The width of the fill of draining material behind the abutment will be calculated according to the SNiP 3.06.04-91.

##### **406.02. Materials**

The free draining granular soil, used for the works of this chapter shall have a filtration

coefficient not less than 2.00 m in 24 hours and must comply with Technical Specification, SNiP 3.06.04-91. The filtration coefficient will be determined according to SM GOST 25584-90\*. Washed out stream and river banks will be reinstated using normal soil of sandy clay.

## **Working conditions**

### **406.03. General requirements**

The free draining and normal material for fill may only be used after the quality of the material has been tested and verified according to the Technical Specification and approved by the Engineer.

The requirements for the fill and the testing methods are indicated in the SNiP 3.06.04-91. The soil will be spread in layers of 10-15cm thickness and compacted by rammers or vibrating plate compactors and by hand where mechanical compaction is not possible at the optimum moisture content. The coefficient of compaction of the soil 98%. The moisture content and the properties of the soil shall be determined according to the paragraph 201.11. For repairs to sloping surfaces, benches shall be cut in the existing surfaces.

### **406.06 Acceptance of work**

Acceptance of the work will be in accordance with chapter 001. Work shall comply with SNIP 3.06.04-91, technical specifications and be approved by the Engineer.

## **Measurement.**

The work executed under this chapter shall be measured as the cubic metres of compacted soil placed under the appropriate location in one of the three fill items below. Excavation in river beds shall be measured in cubic metres of material excavated and removed.

## **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>Item.</b>	<b>Unit of measure</b>
40601 Filling the gaps behind the abutment with free draining soil	cubic metre
40602 Reinstatement of the slope semicones and of the embankment slopes on the approaches to the bridges using free draining soil	cubic metre
40603 Reinstatement of the slopes of the river bed with normal soil	cubic metre
40604 Excavation in river beds	cubic metre

## **CHAPTER 407. EXPANSION JOINTS**

### **Description**

#### **407.01. Introduction**

The present works consist of the replacement of the expansion joints. New joints will be executed using an approved proprietary expansion joint, appropriate to the size of deck and incorporating a waterproof, elasticated rubber covering sealed on top of the joint.

### **Materials**

#### **407.02. Materials**

The materials and devices used in this chapter must be in accordance to:

Expansion joint set with a reinforced rubber elasticator covering device	The manufacture's standards
Reinforcement	Technical Specification, SM GOST 5781-82*****
Bituminous mastic	SM GOST 15836-79
Concrete and components	Technical Specification, SNiP 3.06.04-91, Design type 3.503.1-101
Asphalt concrete	Technical Specification, SM STB 1033:2008

Proprietary joints shall be fixed to the deck by drilling and using bolts of approved material set in epoxy.

### **Working conditions**

#### **407.03. General Requirements**

For the existing bridges and overpasses, in the new expansion joints area, the pavement of the carriageway will be taken out, to expose the surface of spans and abutment end walls.

Proprietary joints shall be installed in compliance with the Manufacturer's Specifications and instructions.

Expansion joints shall be assembled and fitted only when air temperatures are above +50C.

#### **407.04. Works acceptance.**

The construction of the expansion joints for bridges will be accepted on the basis of chapter 001 provided they are in accordance to the project requirements, technical specifications and are approved by the Engineer.

### **Measurements.**

The works for the construction of expansion joints will be measured in linear meters, along the joint for each of the three item descriptions given below. This measurement shall be the only measurement for works under this chapter and shall include for all operations necessary to provide the completed expansion joints in place including the proper reinstatement of the pavement, if applicable.

### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

Item	Unit of measure
40701 Construction of Proprietary expansion joints	linear metre

## **CHAPTER 408. WATERPROOFING**

### **Description**

#### **408.01. Introduction**

The works under this chapter include the repairing/replacement of the waterproofing to the carriageway and walkways of existing bridge decks. For reference, the works of waterproofing on new bridges includes the application of a regulating layer of concrete 30 mm thickness, the waterproofing layer and a protection layer of reinforced concrete of 40 mm thickness. During the repair of waterproofing works on existing bridges it will be necessary to remove the protection layer of reinforced concrete. If the regulating layer has deteriorated or is damaged then such damaged areas shall be removed and reinstated for the full layer thickness. The reinstatement of the asphalt pavement over these works is not included in the repair and execution work of waterproofing and is payable under the appropriate items of Chapter 3.

The works of this chapter also include waterproofing works on the reinforced concrete walkways of bridge decks.

The works of this chapter also include waterproofing works to buried infrastructure elements. These consist of two layers of bituminous mastic being applied by brush in compliance with VSN 32-81.

### **Materials**

#### **408.02. Materials**

The materials used in waterproofing shall be in accordance with the following requirements

Treatment with bituminous mastic	VSN 32-81
Bituminous mastic	VSN 32-81
Rolls of reinforced waterproofing membrane of 4 mm to 6mm thick	VSN 32-81
Concrete for the levelling and protection course	Technical Specification, Project-tip 3.503.1 - 101
Asphalt concrete	SM STB 1033:2008, Chapter 3 this Specification
Metallic mesh for the protection course	SM GOST 23279-85



## **Working conditions**

### **408.03. General requirements.**

The levelling course, waterproofing and the protection layer shall be executed in accordance with the project drawings, Design type 3.503.1 – 101, VSN 32-81 and SNiP 3.06.04 – 91.

If the existing levelling course is damaged on the carriageway, this will be taken out down to the structural deck level. The levelling course will be kept if it is in good condition.

The waterproofing will be carried out on the smooth, clean, dry surface of the levelling course. The waterproofing will be done only after the expansion joint elements have been installed.

The waterproofing membrane will be laid on the levelling course of the deck, adhesion will be achieved by gas flame heating, Waterproofing materials will be overlapped by at least 10 cm at all joints, laps will be arranged to lie in the direction of drainage flow; Any overlap for a subsequent layer will be offset at least 30 cm. From the preceding lap. The waterproofing shall to be smooth, continuous, without signs of swelling or bubbling on the surface and shall be firmly adherent throughout. The reinforced concrete protecting course must laid immediately after waterproofing. These works are followed by walkways and asphalt pavement works when the RC protection layer has cured. Waterproofing works must be carried out only when air and concrete deck temperatures are higher than 5°C.

Waterproofing to the existing walkways of reinforced concrete unitss will be carried out after execution of safety parapets indicated in chapter 417 using the same materials and process as for the decks. The works will be executed according to VSN 32-81 and the waterproofing will be covered with a layer of asphalt, as specified in chapter 413.

Waterproofing to the faces of buried elements of the abutments and wingwalls shall be made in accordance with the requirements of VSN 32-81 using and approved bituminous mastic applied by brush in at least two coats. Such waterproofing shall be fully dry before being buried.

### **408.04. Acceptance of works**

Waterproofing to new and existing structures will be accepted according to chapter 001 provided it is in accordance with project requirements and Technical Specification and is approved by the Engineer.

## **Measurement**

Waterproofing will be measured in square metres of surface waterproofed under the four different classes of waterproofing itemised below .

## **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>Item</b>	<b>Unit of measure</b>
40801      Waterproofing to existing bridge decks	square metre

40802	Waterproofing to new bridge decks	square metre (not used)
40803	Waterproofing to walkways	square metre
40804	Waterproofing to buried elements of the abutments and wingwalls	square metre

## **CHAPTER 409. SAFETY BARRIERS**

### **Description**

#### **409.01. Introduction**

The works under this chapter include the provision and erection of metal safety barriers for the safety of vehicular traffic on bridges and on the approach to bridges. Barriers, posts and fittings shall be hot dip galvanised.

The removal of the old parapets on bridges and embankments are included in chapter 418.

### **Materials**

#### **409.02. Materials**

Materials and prefabricated units used for the works of this chapter have to be in accordance with:

Concrete for foundations	Project Drawings, SM GOST 26633-91** and SNIP 3.06.04-91, This Specification
Metal Safety Barriers	Project Drawings, SM GOST 26804-86
Paint	SM GOST 26804-86 and SNiP 3.04.03-85 CPE.04.03-2005, SNiP 2.03.11-85

### **Execution**

#### **409.03. Working requirements**

Execution of the works of metal safety barriers on embankment shall be in accordance with the requirements of chapter 701 but with reference to the bridge drawings.

Execution of the works of metal safety barriers on structures shall generally conform to the requirements of chapter 701 except that the details of the structures shall conform to the appropriate project drawings and the erection shall be by bolting down to the deck. Two variants are foreseen: one variant with a short post mounted on an existing concrete stub footing and one variant with a longer post mounted directly to the deck. These variants are shown in the Drawings.

Galvanising of all elements shall conform to the requirements of chapter 701.

#### **409.04. Acceptance of works**

The works will be accepted under chapter 001 provided they are in accordance with the drawings, SM GOST 26804-86 and these Specifications and are approved by the Engineer.

### **Measurement**

The provision and installation of metal safety parapets shall be measured in linear metres of each type of parapet installed measured along the face of the rail.

## Payment

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	Item	Unit of measure
40901	Execution of metal safety parapets on the bridge deck	linear metre
40902	Execution of metal safety parapets with stub foundation on the bridge deck	linear metre
40903	Execution of metal safety parapets on the embankment	linear metre
40904	Painting of the poles of the metal safety parapets	linear metre

## CHAPTER 410. SURFACE WATER DISPOSAL

### Description

#### 410.01. Introduction

This category of works includes the construction of water disposal chutes, located on the slopes, of embankments, and the repair of drainage gullies and outlets in bridge decks. The chutes will be constructed according to the project designs Design type 503-09-7.84. Chutes are made using precast reinforced concrete units.

Note that the repair of chutes is covered in chapter 502.

Repair of drainage gullies in bridge decks will require the provision of cast iron gratings to gully entries where these are missing and repair works to the extremities beneath the bridge decks requiring the extension of the outlet pipe to a point below the lowest part of the adjacent deck structure. Extension shall be by means of plastic pipe. Where the existing extremity is of sufficient length the extension pipe shall be clamped in place. Where the remaining extremity is too short for this option alternative means of attachment shall be found; use of an epoxy adhesive is foreseen in these circumstances. Such repairs shall conform to Design type 3.503.1-81.

### Materials

#### 410.02. Materials

The materials and the precast reinforced concrete units used must be in accordance with the technical specification and the Design type 503-09-7.84.

The grid used on the outlets must comply with this specification and the Design type 3.503.1-81. The metal must be painted in accordance with SNiP 2.03.11-85 and 3.04.03-85 CPE .04.03-2005.

### Working Conditions

#### **410.03. General Requirements.**

Any earthworks required in the repair of chutes will be executed according to Chapter 203.

The foundation for chutes must be strictly parallel to the designed surface of the embankment and chutes.

Any parts of the PC chute units, that are in a contact with the soil, must be treated with a layer of bitumen according to SNiP 3.06.03-85.

The provision of metal grilles to bridge deck gully inlets shall include all necessary works, including reseating the surround frame if necessary, to provide a well fitting grille parallel with the finished surface of the bridge deck and set 20mm below the level of the final asphalt surface (tolerance +/- 5 mm).

The work on gully inlets shall be co-ordinated with any deck waterproofing work to ensure that neither item of work disrupts/damages the other.

#### **410.04. Precast reinforced concrete units**

Pre cast concrete chute units will preferably be supplied from a precast factory equipped for the production of such units. If units are precast on site the concrete works shall be in accordance with Chapter 504 and reinforcement will be in accordance with SM GOST 23279-85 and SM GOST 5781-82\*\*\*\*. The detail design of any chutes, whether cast on site or provided from a precast factory shall be subject to the review and approval of the Engineer.

#### **410.05. Concrete works**

All in situ concrete works will be executed in compliance with the provisions of Chapter 504.

#### **410.06. Acceptance of works**

Works under this chapter will be accepted on the basis of compliance with the drawings of the Design type 503.09-7.84, the relevant specifications including Chapter 001, and their acceptance by the Engineer.

#### **Measurement**

The construction of chutes will be measured in linear metres along the centre line of the chute.

Repair works to gullies in bridge decks will be measured in units repaired with inlets (metal grilles) and outlets (extension pipes) measured separately.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41001	Construction of chutes on the slope	linear metre
50204	Repair of chutes on the slope	linear metre
41002	Repairs and replacement grilles to bridge deck gully inlets	unit
41003	Repairs and extensions to bridge deck gully outlets	unit

## CHAPTER 411. ACCESS STAIRS ON SLOPES

### Description

#### 411.01. Introduction

The works under this chapter comprise the construction of access stairs on the earthworks slopes at the approaches to the bridges and the repair works of existing stairs. Repair works consist in casting concrete in the deteriorated gaps and mounting of metal safety rails for pedestrians.

### Materials

#### 411.02. Materials

The materials, precast units and prefabricated items for use in this work shall be in accordance to the following requirements:

Crushed stone for the bed underneath the stairs	SM GOST 8267-93***
Concrete and components	Project Design, GOST 26633-91**and SNIP 3.06.04-91
Reinforcing bars and build-in elements	Project Design, SM
Metallic handrails for the stairs	GOST 5781-82***** Project Design

The materials used for reinforced concrete stairs shall comply with the requirements of chapter 403.

The handrails and all fixings and fittings shall be hot dip galvanised after fabrication in accordance with the standards for guard rails in chapter 701.

The paints used shall comply with the requirements of SNiP 2.03.11-85 and design drawings 3.04.03-85 CPE.04.03-2005.

### Working conditions

#### 411.03. General conditions

The construction of the stairs will be made after the earthworks on the approaches are completed

For the construction of the stairs precast units will be used. The units shall be fabricated in accordance with the requirements of chapter 504 to a detail design in accordance with the project drawings and approved by the Engineer. Any in situ concrete required for the positioning and fixing of the PC stair units shall be in accordance with the requirements of chapter 504.

The required earthworks for the stairs will be in accordance with chapter 203.

#### 411.04. Work acceptance

Acceptance of the works will be on the basis of chapter 001. Works shall be in compliance with Technical Specification and with the drawings and shall have the approval of the Engineer.

### Measurement

The execution of access stairs and repair works will be measured in linear meters along the slope stairs, starting at the top and finishing at the bottom of the embankment.

### Payment

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41101	Construction of new slope access stairs	linear metre
41102	Repair works to existing slope access stairs	linear metre

## **CHAPTER 412. PROTECTION OF SURFACES**

### **Description**

#### **412.01. Introduction**

The works under this chapter include the provision of hard protection to semicone slopes and approach embankment slopes, the repair of existing protection of this nature and the provision of protection to the river bed beneath bridges.

### **Materials**

#### **412.02. Materials**

The materials used for these works must comply with the following requirements:

Concrete and components	SM GOST 26633-91**, SNIP 3.06.04-91 and Chapter 504
Reinforcement	SM GOST 5781-82*****
Crushed stone	SM GOST 8267-93***
Stone of 25 cm size	SM GOST 8267-93***

### **Working conditions**

#### **412.03. General requirements**

Protection works shall be executed in accordance with project Design type 3.503.1-156. The protection must be executed on a smooth and compacted surface, which has been divided into strips according to the Design type 3.503.1-156.

Reinforcing works must be executed in compliance with the requirements of SNIP 3.06.04-91.

All concrete protection shall be reinforced with a single layer of 200x200mm mesh of 6mm diameter wires complying with SM GOST 5781-82\*\*\*\*\*.

Any filling required to make good cone surfaces and embankment slopes prior to applying protection shall be executed in accordance with the requirements of chapter 406.

The demolition, removal and cleaning work required to prepare damaged or deteriorated protection for repair with reinforced concrete, are included in chapter 418.

#### **412.04. Protection of the conical surfaces at bridge abutments.**

The protection of conical surfaces will be executed of reinforced concrete cast-in-situ of 8 cm thickness on a layer of crushed stone of 10 cm thickness.

#### **412.05. Protection to embankment slopes at bridge approaches.**

The protection of embankment slopes adjacent to the abutment will be formed using a 12 cm. Thickness of concrete cast-in-situ with 12 cm thickness over a layer of crushed stone 10 cm. in thickness. The protection of the embankment slopes of the approaches will carried out for a length not less than 1.00 m.

#### **412.06. Protection to river beds beneath bridges**

The protection of river beds beneath bridges will comprise a layer of boulder rock of 50 cm thickness over a layer of crushed stone of 10 cm thickness and will be carried out in conformity with the project Design type 3.501.1-156

#### **412.07. Acceptance of works**

Acceptance of the works will be on the basis of chapters 001. Works shall be in compliance with Technical Specification, the drawings, SNIP 3.06.04-91, Design type 3.501.1-156, and shall have the approval of the Engineer.

#### **Measurement**

The slope protection and repair works with reinforced concrete cast-in-situ and the river bed protection with boulder rock will be measured in square meters of the protected or repaired surface.

The work of filling and making good the cone slopes with free draining material will be accepted and measured in accordance with chapter 406.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41201	Protection of the semicone slopes with reinforced concrete of 8 cm thickness over a layer of crushed stone of 10 cm thickness	square metre
41202	Repair works to existing protection of semicone slopes with reinforced concrete of 8 cm thickness over a layer of crushed stone of 10 cm thickness	square metre
41203	Protection to approach embankment slopes with reinforced concrete of 12 cm thickness over a layer of crushed stone of 10 cm thickness	square metre
41204	Protection to the river bed with boulder rock of 50 cm thickness over a layer of crushed stone of 10 cm thickness	square metre

### **CHAPTER 413. ASPHALT CONCRETE TO PAVEMENT AND SHOULDERS**

#### **Description**

### **413.01. Introduction**

The works in this chapter cover the application of asphalt concrete surfacing to the completed bridge deck and bridge walkways and as protection to the shoulders on the approaches.

The work of demolishing and removing asphalt pavement on bridge decks is covered in chapter 418.

### **Materials**

#### **413.02. Materials**

The materials for use in the works of this chapter shall conform to the following requirements::

Asphalt concrete	Chapter 308 and SM STB 1033:2008
Bituminous prime coat	Chapter 307 and SNIP 2.05.02-85
Crushed stone	SNIP 2.05.02-85, SM GOST 8267-93***

### **Working conditions**

#### **413.03. Carriageways and walkways**

After completion of all waterproofing and waterproofing protection and of all works to bridge deck gullies, carriageways on bridges will be covered with 70mm of asphalt wearing course material of fine aggregate type A Ml H. Asphalt will be laid in two layers; a first layer of 40mm and a final layer of 30mm. Laying will be in accordance with the requirements of chapter 308 for machine laid asphalt. Before the asphalt is laid, the supporting surface will be tack-coated using bituminous emulsion according to the requirements of chapter 307. The finished asphalt layer shall meet the surface tolerances given in chapter 308.

A 40mm layer of asphalt will be laid on the precast unit walkways of the existing bridges. The 40mm asphalt layer walkways will be laid on the waterproofing after completion of waterproofing works. Asphalt to walkways will be laid in compliance with the requirements of chapter 311.

#### **413.04. Shoulders**

Where indicated on the Drawings or directed by the Engineer, shoulders to bridge embankment approaches shall be protected with a 50mm. layer of asphalt on a base of crushed stone of 100mm thickness.

Base and asphalt to shoulders shall be in compliance with the requirements of chapters 306, 308 and 311. Asphalt protection to shoulders shall be laid after the execution of the safety guardrails and the drainage chutes.

#### **413.05. Work acceptance**

Acceptance of the works of asphalt to bridge decks and walkways and shoulder protection will be under chapter 001, The works shall be in accordance with SNIP 3.06.03-85, the Drawings and Specification and shall be to the satisfaction of the Engineer.

### **Measurement**

The pavement works on the carriageway, existing walkways and the shoulder protection works shall be measured in square metres of the finished surfacing laid of the specified thickness or in tons of asphalt used. The measurement of the shoulder protection shall include within this asphalt measurement the provision of crushed stone base layer and any excavation and disposal of material required to perform the works of shoulder protection.



## Payment

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	Item	Unit of measure
41301	Laying of 70 mm of fine asphalt Type A, M-I, on the carriageway of the bridge deck in two layers	square metre
41302	Laying of 40mm of fine asphalt Type A, M-I, on the walkways	square metre
41303	Shoulder protection of fine asphalt Type A, M-I, of 50mm thickness, over a subbase of crushed stone of 100mm thickness	square metre

## CHAPTER 414. PEDESTRIAN SAFETY PARAPETS

### Description

#### 414.01. Introduction

The works consist of the provision of new metal pedestrian safety parapets, the repair of existing parapets and cleaning and painting of all the parapets.

### Materials

#### 414.02. Materials

The materials and elements shall comply with the following requirements:

Standard sections of metal pedestrian parapets	Technical Specification, Design type 3.503.1-81
Paints	SNIP 2.03.11-85, SniP3.04.03-85 CPE.04.03-2005, SM GOST 9.032-74*

### Working Conditions

#### 414.03. General Requirements.

Metal pedestrian safety parapets shall meet the requirements of the Design tip 3.503.1-81

The bent and damaged elements of the existing parapets shall be straightened, rewelded where necessary and reused, those elements which are too badly rusted to permit repair shall be replaced by new ones. The work of repair shall include all necessary dismantling and re-erection of parapet elements.

Painting of parapets shall to be executed according to the SNIP 3.04.03-85 CPE.04.03-2005 and 3.06.04-91. Before painting, all old paint, rust, grease and oil and any other contaminants shall be removed and the parapet elements cleaned to bright metal. Immediately after cleaning, the parapet elements shall be given a full coat of zinc rich, epoxy based, cold galvanising compound followed by two coats of calcium plumbate primer applied to dry film thickness of at least 0.025 mm. The undercoat and balance of the approved paint system shall follow within one week of the primer. The colour and quality of the paints to be applied shall be approved by the Engineer.

#### **414.04. Work Acceptance**

Acceptance of the works of pedestrian parapets to bridge walkways will be under chapter 001. The works shall be in accordance with Design tip 3.503.1-81, the Drawings and specification and shall be to the satisfaction of the Engineer.

#### **Measurement**

The works related be the assembly and repair of the pedestrian parapets are measured in linear meters, on the total length of parapet provided, repaired and painted..

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41401	Repair of metal pedestrian parapets	linear metre
41402	Provide and erect new metal pedestrian parapets	linear metre
41403	Painting of metallic pedestrian parapets	linear metre

### **CHAPTER 415. BRIDGE BEARINGS**

#### **Description**

#### **415.01. Introduction**

The works of this chapter include the provision of bearing pads of reinforced rubber bridge decks. The works include insertion of rubber bearings to bearing platform.

#### **Materials**

#### **415.02. Materials**

The materials used for the works described in this chapter shall be in accordance with the following requirements:

Priming and painting	SM GOST 9.032-74*, SNiP 2.03.11-85, 3.04.03-85 CPE.04.03-2005
Reinforced rubber bearings pads	VSN 86-83
Concrete with polymer	SNiP 3.06.04-91
Reinforcement	SM GOST 5781-82*****
Mortar	SM GOST 28013-89**

#### **Working conditions**

### **415.03. Equipment**

The following items of equipment are likely to be required:

1 Motocrane for assembly and dismantling of the temporary works

### **415.04. Mounting bridge decks for mounting of rubber bearings**

Bridge decks shall not be lowered onto the new bearings until at least 7 days after all concrete and mortar works in the vicinity of the bearing pads have been completed.

### **415.05. Bearing painting-not used**

### **415.06. Trafficking on the bridge deck**

Passage of vehicular traffic on the deck will be permitted immediately after mounting the deck on the reinforced rubber bearing pads and removal of the jacking equipment but not before all concrete used in repairs in the area of the bearings has reached at least 75% of the designed strength.

### **415.07. Works acceptance**

The installation of rubber bearing pads will be accepted under the provisions of Chapter 001 provided all work complies with the drawings and Specifications and meets with the approval of the Engineer.

#### **Measurement**

The installation of rubber bearing pads shall be measured by the number of bearings. All ancillary repair works to beam ends, bearing areas, collar beams, etc. shall be measured and paid under the provisions of chapter 401, paragraphs 401.01 and 401.02.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41501	Provision and installation of rubber bearing pads	unit

## **CHAPTER 416. NOT USED**

## **CHAPTER 417. SLABS TO BRIDGE DECKS, BRIDGE WALKWAYS, PARAPETS.**

### **Description**

### **417.01. Introduction**

The works covered in this chapter include cast in situ reinforced concrete slabs forming parts of the bridge deck, the parapet foundation on bridges and forming reinforced concrete walkways on bridges. The works shall be executed in accordance with the

requirements of the drawings and specifications and of SNiP 3.06.04-91.

## **Materials**

### **417.02. Materials**

Materials used for the works of this chapter shall be in accordance with the following requirements:

Concrete	Technical specification, SM GOST 26633-91** SNiP 3.06.04-91
Reinforcement and built in elements	Technical specification, SM GOST 5781-82****, SNiP 3.06.04-91
Epoxy glue	SNiP 3.06.04-91, Appendix 10

## **Working conditions**

### **417.03. General conditions.**

The works shall be executed in accordance with the requirements of these technical specification and of SNiP 3.06.04-91

### **417.04. Equipment..**

The following equipment is likely to be required for the works under this chapter.:

- 1 Crane, for erection and dismantling of formwork, installation of reinforcing mesh and placing concrete;
- 2 Drill for making holes in the concrete of a diameter up to 20 mm, for connections;
- 3 Welding equipment;
- 4 Oxyacetylene/Airacetylene burner for bending reinforcement for the parapet foundation;
- 5 Vibrators for compaction of cast-in situ concrete.

### **417.05. Formwork**

Formwork shall be in accordance with the requirements of SNiP 3.06.04-91.

### **417.06. Reinforcement**

Reinforcing works are to be carried out according to SNiP 3.06.04-91. No reinforcement shall be brought on to the site or used without a manufacture certificate certifying that it complies with requirements. Any change or substitution in the category class, diameter, or type of the steel, required by the Drawings or Technical Specification must be agreed by the Engineer.

Before use, all reinforcement must be cleaned of rust, mud, dust and grease, Lap joints of reinforcing bars are to be executed by overlapping by a length of at least 30 bar diameters and in compliance with requirements of the Technical Specification.

Where the welding of reinforcement and built-in elements is unavoidable the work shall be executed in accordance with the requirements of SM GOST 14098-91. Welding of reinforcement shall be avoided wherever possible and shall not be carried out without the explicit permission of the Engineer.

#### **417.07. Concrete Works**

Concrete mixing, transportation and casting, as well as concrete curing works are to be carried out in accordance with the requirements of this Specification, SM GOST 26633-91\*\* and SNiP 3.06.04-91.

No concrete mixture which has lost its required workability shall be used. It is not permissible to improve the concrete workability by adding additional water into the mixed concrete.

Any defects on exposed surfaces after removing formwork will be made good by smoothing with sand cement mortar if the Engineer approves. If the defect is too serious for such approval the Contractor shall remove the defective work and replace it at his own cost.

#### **417.08. Waterproofing**

Waterproofing works will be executed in accordance with paragraph 402.09

#### **417.09. Works Acceptance**

The works will be accepted in accordance with the provisions of chapter 001 provided they are in accordance with this Specification, SNiP 3.06.04-91, VSN 32-81 and are to the satisfaction of the Engineer..

##### **Measurement**

The works of the bridge deck slab, the walkways and the middle lane slab shall be measured in cubic meters of reinforced concrete used in each of the type of work.

The works of the parapet foundation will be measured in linear meters of the length of the parapet foundation constructed.

No separate measurement will be made for any other connected item of work. Measurement under the items below shall be the full and complete measurement of all materials and works required for the works under this chapter, including concrete, reinforcement, any built in items, formwork and all other temporary works.

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41701	Bridge deck slabs of in situ reinforced concrete	cubic metre
41702	In situ reinforced concrete walkways to bridge decks	cubic metre
41703	In situ reinforced concrete parapet foundations to bridge decks	linear metre

## **CHAPTER 418. WORKS OF DISMANTLING AND DEMOLITION**

### **Description**

#### **418.01. Introduction**

Works covered in this chapter cover the various types of demolition required in the execution of bridge works and include the following:

- Demolition of reinforced concrete parapets;
- Dismantling of metal pedestrian parapets;
- Dismantling of reinforced concrete walkways;
- Removal and disposal of existing asphalt layer on bridges;
- Removal and disposal of existing pavement on the approaches to bridges;
- Demolition of the protection layer, the waterproofing, and the levelling layer on bridge decks;
- Dismantling of bridge decks slabs of reinforced concrete; 3,90, 4,80, 8,66, 11,36m length;
- Dismantling of bridges collar beams, piers, abutments, retaining and wing walls, approach slabs, protection surfaces on slopes and semicones, access stairs on slopes;
- Demolition of reinforced concrete in infrastructure and deck elements;
- Demolition of the deteriorated elements of the reinforced concrete protection on river beds and bridge abutment slopes;
- Demolition of reinforced concrete at deck beam joints;
- Demolition of deteriorated reinforced concrete stairs on bridge abutment slopes
- Removal of metal expansion joint elements

### **Working conditions**

#### **418.02. Equipment.**

The following equipment is likely to be required for the works under this chapter.

- 1 Crane for removal of bridge deck slabs length 3,90, 4,80, 8,66, 11,36 m.; weight 12 tons;
- 2 Crane for removal of walkway elements; weight 2 tons;
- 3 Oxyacetylene cutting equipment;
- 4 Compressor(s) with tools for demolition of concrete and of asphalt surfacing;

#### **418.03. Dismantling and demolition of elements**

Dismantling and demolition of the various bridge elements must be executed so as not to deteriorate the structure of the concrete and waterproofing left in the remaining structure, and not to damage the existing reinforcement.

The waste material from demolition shall be transported and disposed of in accordance with the requirements of this specification and in accordance with the regulations of the local authorities. Complete prefabricated elements arising from the demolition and dismantling which are considered to have further utility shall be identified by the Engineer and transported by the Contractor to the Employer's designated storage compound.

#### **418.04. Works Acceptance**

The works will be accepted in accordance with the provisions of chapter 001 provided

they are in accordance with this Specification, Design type 3.503.1-81, SNiP 3.06.04-91, VSN 32-81 and are to the satisfaction of the Engineer

### **Measurement**

The various works of dismantling and demolition will generally be measured in cubic metres of items dismantled and demolished. This volumetric measurement shall be strictly net. If appropriate, agreement may be reached with the Engineer on a case by case basis to measure the quantity of demolished material on a tonnage basis and then use typical densities to transform this measurement to Cu.m. for payment purposes.

Metal parapets dismantled and scrapped as unusable shall be measured in linear metres of parapet prior to demolition.

Demolition of metal expansion joint elements shall be measured by the linear metre.

Asphalt pavement to bridge decks shall be measured in square metres.

### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

	<b>Item</b>	<b>Unit of measure</b>
41801	Demolishing of reinforced concrete parapets of the bridge or embankment	cubic metre
41802	Dismantling of the metal pedestrian parapets	linear metre
41803	Dismantling of the walkways of reinforced concrete	cubic metre
41804	Removal of the asphalt pavement on the bridge deck	square metre
41805	Removal of the pavement on the approaches to the bridge	cubic metre
41806	Demolishing of superstructure waterproofing including protective and regulating layers	square metre
41807	Dismantling of PC reinforced concrete deck slabs of 3,90, 4,80, 8,66, 11,36 m length	cubic metre
41808	Miscellaneous Demolition of reinforced concrete to bridge infrastructure and deck elements	cubic metre
41809	Demolition of the deteriorated elements of the reinforced concrete protection on river beds and abutment slopes	cubic metre
41810	Demolishing of reinforced concrete to deck beam joints.	cubic metre

41811	Demolition of deteriorated reinforced concrete stairs of on abutment slopes	cubic metre
41812	Dismantling of bridges collar beams, piers, abutments, retaining and wing walls, approach slabs, protection surfases on slopes and semicones, access stairs on slopes	cubic metre
41813	Demolishing of metal expansion joint elements	linear metre

## **5. DRAINAGE STRUCTURES**

### ***CHAPTER 501. CULVERTS AND DRAINAGE FACILITIES***

#### **501.01. Introduction**

This work consists of constructing culverts, extending existing culverts and/or replacing culverts and other drainage facilities

#### **501.02. General**

Culvert units and materials used for the works should meet SNiP 2.05.02-85, OST 35-27.0-85, OST 35-27.1-85, OST 35-27.2-85, SM GOST 5781-82.

#### **501.03. Joint sealing**

Joints shall be sealed with materials of a type and mix design accepted by the Engineer.

#### **501.04. Pipes**

Culvert pipes shall conform to SNiP2.05.03-84, SM GOST 12586.0-83 and SM GOST 12586.1-83. The length of culvert pipes shall be as stipulated in the Album of typical drawings unless otherwise specified. Concrete pipe shall be 2.5 m in length unless otherwise specified.

#### **501.05. Generalities**

The extension of the culverts shall be carried out using precast elements, indicated on the drawings, the dimensions and location will be in accordance with the drawings.



#### **501.06. Extension of the existing culverts**

The extension of existing culverts shall commence with the removal of the existing culvert extremities. Starting at the lower end lay the bell or groove end upgrade. Fully joint all sections. Surplus materials shall be removed from the site and disposed in accordance with the Specification. Extension of the existing culverts should be done according to the project drawings. Placing materials and structures shall be done only any preparatory or foundation works have been approved by the Engineer.

#### **501.07. Replacement of existing culverts**

The Contractor shall prepare provisional schemes of traffic control during the Construction periods and obtain approval from the relevant agencies and the Engineer.

Before replacing existing culverts the existing pavement shall be scarified and all pavement and subgrade materials removed.

Dismantled culverts and culvert headwalls and inlet and outlet structures shall be removed from the site and disposed in accordance with the Specification by the Contractor, or, if so instructed by the Engineer, shall be transported to Employer's premises indicated by the Engineer and there stockpiled.

The work of replacement of existing culverts consist of excavation, placing crushed stone bed foundation, installation of culverts, making culvert joints, waterproofing new culvert, inlet and outlet structure installation and waterproofing, backfilling and soil compaction to culvert and inlet and outlet structures according to the chapter 203.

On completion of backfilling to subgrade level the final layers of backfill shall be compacted to the requirements of Sub-Clause 201.13. The laying and compacting of pavement layers shall conform to the requirements of Chapter 303.

#### **501.08. Construction of new culverts**

The construction of new culverts shall be carried out in accordance with the requirements of Sub-Clause 501.07 above with the exception of the requirements in relation to the removal of existing culverts.

#### **501.09. Culverts to property entrances and side roads**

Wherever the sides drain intersect a property entrance or crosses a side road junction, and there is a requirement for a culvert to carry the side drain past the property or side road, a 600mm diameter pipe culvert in the line of the side drain shall be constructed to carry the side drain flow. The property entrance and side road culverts shall be bedded on 150mm crushed stone and backfilled with crushed stone. They shall be provided with headwalls and wingwalls to suit the dimensions of the side drain and ensure a smooth, unobstructed entrance and exit flow. Where shown on the drawings or directed by the Engineer, additional protection works shall be provided at inlet and outlet.

#### **501.10. Additional protection**

Where shown on the Drawings or instructed by the Engineer additional erosion protection shall be provided to side drains and waterways at the inlets and outlets of culverts. Such protection, unless shown otherwise, shall consist of a layer of reinforced concrete in situ or as PC units, having a minimum thickness of 70mm, laid over a

compacted bed of at least 100mm of crushed rock. PC units shall be carefully locked together with mortar pointing and in situ lining shall be provided with expansion joint at not more than 7 metre intervals. Where lining extend over a length of more than 3 metres it shall be provided with weep holes, diameter 50mm, level with the base of the drain on the road side of the lining at 1 metre intervals.

Where additional protection to this standard is considered inadequate because of the unsupported height then a mass or reinforced concrete structure shall be provided in accordance with the design of the Engineer and paid under the provisions of chapter 504.

### **501.11. Works Acceptance**

The work of existing culvert extension, culvert replacement and new culvert construction will be accepted according to Chapters 001 and 002 and to compliance with the drawings and specifications and acceptance by the Engineer.

#### **Measurement**

Extension and replacement of existing culverts and construction of new culverts shall be measured in the following manner:

Removal of existing culvert inlets	Number of inlets and outlets removed
Removal of existing culvert barrels	Linear meters of culvert dismantled and removed
Constructing pipe culvert inlets and outlets (pipe diameter to be stated)	Number of inlets and outlets of each size constructed
Constructing box culvert inlets and outlets (box size to be stated)	Number of inlets and outlets of each size constructed
Constructing pipe culverts (pipe diameter to be stated)	Linear metres of each size of culvert constructed
Constructing box culverts (box size to be stated)	Linear metres of each size of culvert constructed
Extension pipe of culverts (pipe diameter to be stated)	Linear metres of each size of culvert constructed
Extension of box culverts (box size to be stated)	Linear metres of each size of culvert constructed
Protection works to inlets and outlets constructed	Square metres of protection works
Culverts (600 mm dia) to property entrances and side roads	Linear metres of culverts constructed

The linear metre measurement of culverts to side roads shall include the cost of providing appropriate inlet and outlet structures of headwall and wingwalls. Any additional protection works required shall be measured in Sq.m. and paid under the item for protection works where such an item is listed in the Bill of Quantities. If no item is listed, then the costs of additional protection shall be included in the linear metre rate for provision of the culvert.

#### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
50101	Removal of Culvert Inlet or Outlet	Number
50102	Removal of existing culvert barrel	Linear Metre
50103A	Construction of culvert inlets and outlets to pipe culverts (pipe diameter to be stated) m	Number
50104A	Construction of culvert inlets and outlets to box culverts (state size) m	Number
50105A	Construction of new pipe culverts (pipe diameter to be stated)	Linear Metre
50106A	Construction of new box culverts (box size to be stated)	Linear Metre
50107A	Extension of pipe culverts (pipe diameter to be stated) m type TN	Linear Metre
50108A	Extension of box culverts (box size to be stated)	Linear Metre
50109	Additional protection works at inlets and outlets	Square Metre
50110	Construction of culverts (dia 600mm) at entrance to properties and side roads	Linear Metre
50111	Construction of drop inlets to pipe culverts of any diameter	Number

## ***CHAPTER 502.            CLEANING, RECONDITIONING AND REPAIRING EXISTING INLETS, OUTLETS, DRAINS, SPILLWAYS AND CHUTES***

### **502.01.    Introduction**

This work consists of cleaning existing culverts in place, reconditioning existing inlets and outlets and repairing and cleaning existing drains, spillways and chutes.

### **502.02.    Materials**

Concrete shall conform to Table 504-1 of this Specification. Before batching concrete submit the proposed concrete proportions for approval to the Engineer. As a minimum, submit the following:

- (a)** Type and source(s) of all material proposed for use.
- (b)** Material certification for all material proposed for use.
- (c)** Surface dry weight of the fine coarse aggregate per cubic meter of concrete.
- (d)** Gradation of fine and coarse aggregate.
- (e)** Weight of mixing water per cubic meter of concrete.

- (f) Weight of cement per cubic meter of concrete.
- (g) Entrained air content of plastic concrete in percent by volume.
- (h) Maximum slump of plastic concrete in cm.

Joint mortar use for concrete minor structure shall consist of the following:

- a) One part hydraulic cement (see SM GOST 25192-87, SM GOST 26633-91). The cement shall not contain lumps, be partially set, come from previously opened bag or be subject to hydration.
- b) Two parts fine sand free of clay or other deleterious materials.
- c) Water as required to obtain a freely working mix capable of being forced into small small openings, cracks or gaps.

### **502.03.      Cleaning Culverts in Place**

Remove and dispose of all foreign material within the barrel and appurtenances of the culvert (including inlets and outlets) by any method that does not damage the culvert.

### **502.04.      Repairing of the extremities of the culverts**

Remove all debris from inlets and outlets designated to be reconditioned. Repair all leaks and structural damage.

### **502.05.      Repair of Drains, Spillways and Chutes**

Lined side drains which are designated for repair shall be carefully rebuilt to provide the full original drain section in solid, well bedded concrete.

Chutes which are designated for repair shall be dismantled, rebedded, units replaced and all joints carefully mortared to provide a neat workmanlike chute, true to line and slope with upper edges flush with the embankment surface.

### **502.06.      Cleaning lined side drains**

Where directed by the Engineer, existing lined side drains shall be cleared of all accumulated debris. Drains shall be cleaned in the first three months of the contract and maintained clean throughout the duration of the works

### **502.07.      Works Acceptance**

The work will be accepted for payment providing that it has been carried out in conformance to the drawings and specifications pertaining to the segment involved and is accepted by the Engineer.

#### **Measurement**

Repair of culvert joints and cleaning culvert in place will be measured in linear meter of culvert repaired or cleaned. Cleaning will only be measured and paid where no other work is required to the section cleaned. Where other or additional works are required the act of cleaning shall be considered ancillary to such works and shall be included in the

cost of those works. The rate for cleaning shall include the cost of maintaining the cleaned drain or structure in a clean condition throughout the duration of the contract. Repair of inlet and outlet structures shall be measured by the number of inlets and outlets instructed to be repaired regardless of the extent of the repairs. Repair of chutes and spillways and lined side drains will be by the linear meter of structure instructed to be repaired.

#### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
50201	Repair culvert joints	Linear Metre
50202	Cleaning of existing culverts	Linear Metre
50203	Repair of culvert inlet and outlet structures	Number
50204	Repair of Chutes and spillways on embankment slopes	Linear Metre
50205	Repair of lined side drain	Linear Metre
50206	Repair of culvert drop inlet structures	Number
50207	Cleaning lined side drain	Linear Metre

## ***CHAPTER 503. PAVED WATERWAYS***

### **503.01. Introduction**

This work consists of constructing paved chutes on the slopes, lined side drains and lined waterways not contiguous to the travelled way together with the associated inlet and outlet works.

Paved chutes and gullies on the slope are required to transport water from the pavement on embankment to the foot of the slope without erosion,

Paved waterways will be constructed according to the requirements of the Drawings and Schedules.

### **503.02. Materials**

Material shall conform to the requirements of this specification and to the materials

stipulated in the Drawings. Paved waterways of all types shall be constructed using concrete having a maximum aggregate size of 20mm and a minimum compressive strength of 25 N/mm<sup>2</sup> at 28 days. Where mesh reinforcement is required it shall comply with the relevant GOST standard.

### **503.03. Generalities**

Excavation shall be performed accurately to line and level. The bed of the excavation shall be parallel to the required finished surface of the waterway. Concrete mixes shall be designed and approved in accordance with the requirements of Chapter 504.

### **503.04. Concrete Chutes and gullies**

Perform the work according to Chapter 504, utilizing commercially available precast units or purpose made units for chutes. Entry gullies shall be of two types, one type for single direction entry and a second type, to be used at low points, for double direction entry. Where indicated on the Drawings or instructed by the Engineer, chutes shall terminate in a basin constructed as shown on the Drawings. All gullies and chutes shall be in accordance with the details on the Drawings and to the satisfaction of the Engineer.

### **503.05. Lined Side Drains and Waterway**

Lined side drains and lined waterways shall be constructed in accordance with the Drawings including filter materials and crushed stone bedding. Where indicated on the Drawings or instructed by the Engineer, lined side drains shall terminate in a basin constructed as shown on the Drawings. Four types of lined drain are foreseen:

- **Type 1:** A lining of standard size for slopes < 50
- **Type 2:** A lining of standard size incorporating regularly spaced anchor blocks for use on slopes > 50
- **Type 3:** An oversized lining reinforced with mesh reinforcement for major non roadside drains having a top width of 4 metres and a depth of 1 metre incorporating regularly spaced anchor blocks for use on slopes > 50
- **Type 4:** A rectangular side drain of width 60cm and depth 45 cm constructed of in situ reinforced concrete.

### **503.06. Works Acceptance**

The work will be accepted for payment provided that it has been built in conformance to the Drawings and specifications pertaining to the segment involved and are accepted by the Engineer.

#### **Measurement**

Paved spillways/chutes on the slopes and paved side drains and waterways will be measured in linear meters. Entry gullies shall be measured by number of the two types specified and erosion basins shall be measured by number. The cost of any necessary excavation, bedding, support of excavation and backfill shall be included in the costs and shall not be subject to separate measurement or payment with the exception of excavation to the net internal dimensions of side drains which will be measured and paid

separately under the provisions of Chapter 201 as a part of common excavation and of waterways not contiguous to the road which will be measured to the net internal dimensions and this volume paid separately under the provisions of Chapter 202.

**Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

No.	Item	Unit of Measure
50301	New construction of Triangular section chute or spillway on embankment slope 0,6 wide x0.3 deep or other approved section made of precast concrete units or cast in situ	Linear Metre
50302	New construction of Lined side drain or waterway Type 1 with precast concrete units and/or concrete cast in situ.	Linear Metre
50303	New construction of Lined side drain or waterway Type 2 with precast concrete units and/or concrete cast in situ including anchor blocks.	Linear Metre
50303A	New construction of Lined side drain or waterway Type 3 with precast concrete units and/or concrete cast in situ including anchor blocks.	Linear Metre
50304	Construct chute entry gully, double sided entry	Linear Metre
50305	Construct chute entry gully, single sided entry	Number
50306	Construct basin to lined side drain or waterway	Number
50307	Construct basin to embankment chute. waterway	Number
50308	New construction of Lined side drain Type 4 with precast concrete units and/or concrete cast in situ rectangular 0.60 x 0.60.	Number

## **CHAPTER 504. MINOR CONCRETE STRUCTURES**

### **504.01. Introduction**

This chapter covers the basic requirements for the construction of minor concrete structures and shall be read in conjunction with other chapters as appropriate.

### **504.02. Materials**

1. Aggregate shall conform to SM GOST 10268-84 (not listed CHECK) and shall consist of hard durable particles of fragments of crushed stone, crushed slag or crashed gravel and shall be subjected to the following tests: Sieve analysis, Strength, Wearing and amount of dust particles.
2. Mortar - the joint filler used for concrete minor structures shall consist of the following:
  - a) One part hydraulic cement see SM GOST 10178-85 and table 3.1 of SNIP 2.05.02-85
  - b) Two parts fine sand free of clay or other deleterious materials.
  - c) The maximum water cement ratio shall be 0.5 as required to obtain a freely working mix capable of being forced into small interstices.
3. Portland cement.



Portland Cement shall meet the following specifications: SM GOST 10178-85

Do not use cement which has lumps, become partially set or is salvaged from previously opened bags. Do not mix brands or types of cement from different mills without the Engineer's approval.

Concrete curbs can be cast-in-situ or prefabricated in unified block length.

### **504.03. Concrete Composition**

Concrete shall conform to Table 504-1. Before batching concrete the Contractor shall submit the proposed concrete proportions for approval. As a minimum, the submission shall comprise the following:

- a) Strength of Concrete demonstrated by test cubes from design mix
- b) Type and source(s) of all material proposed for use.
- c) Material certification for all material proposed for use.
- d) Surface dry weight of the fine and coarse aggregate per cubic meter of concrete.
- e) Gradation of fine and coarse aggregate and proportions to be used
- f) Weight of mixing water per cubic meter of concrete.
- g) Weight of cement per cubic meter of concrete.
- h) Entrained air content of plastic concrete in percent by volume.
- i) Maximum slump of plastic concrete in cm.

**Table 504.1: Composition Concrete of Minor Structure**

Property Specification:	SM GOST 26633-91
Maximum W/C ratio:	0.49
Maximum slump, cm:	10
Minimum air content, percent:	4
Size aggregate:	Varies
Minimum 28-day compressive strength, MPa:	20.7

### **504.04. Generalities**

Excavation and backfill shall be performed in accordance with the requirements of chapter 203.

Forms shall be so designed and of sufficient strength that there is no loss of shape, bulging or warping under site conditions or concrete pressure, and such that they permit

of ready removal without causing damage to the concrete.

Forms shall be of wood, metal, or other suitable material. They shall be kept clean and coated with form release agent or form oil before placing concrete.

#### **504.05. Casting Concrete**

Moisten the forms and foundation immediately before casting concrete. Once the casting of concrete has begun, it shall be carried out in a continuous process between construction joints. Concrete shall be placed within one hour from the start of mixing. This time may be extended by the Engineer where a retarding admixture has been used. Concrete shall be transported and placed in a manner that will prevent segregation or loss of the constituent materials or the contamination of the concrete. . Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a construction joint has been formed or unless a retarding additive has been used in the concrete.

When the ambient temperature exceeds 30°C during concreting, the Contractor shall take measures to control the temperature of the concrete ingredients so that the temperature of the placed concrete will not exceed 30°C.

The temperature of the placed concrete shall not be allowed to fall below 5°C until the concrete has attained strength of at least 5 MPa, and the Contractor shall be responsible for all protective measures necessary to this end. All concrete damaged by frost or by the formation of ice in the concrete shall be removed and replaced by the Contractor at his own expense.

#### **504.06. Curing Concrete**

Cure concrete a minimum of 7 days by covering with burlap sacking and keeping wet at all times or other approved materials/methods as approved by the Engineer, to protect against the harmful effects of weather, including rain and from drying out.

Finish exposed concrete surfaces according to the following:

Repair of surface defects shall begin immediately after form removal and/or as soon as is practically possible in accordance with the approved repair method statements.

Surface defects are defined to include, form tie-holes, air voids or pockets, bug holes, honeycombed areas, rock pockets, visible construction joints and burrs.

Freshly laid concrete surfaces that are less than one hour old may be repaired with concrete mortar in accordance with Chapter 401. After the mortar is set rub it down with burlap sacking or other approved material until a reasonable blend of the fresh exposed surfaces to surrounding concrete is achieved.

Carefully tool and remove free mortar and concrete from construction joints.

#### **504.07. Works Acceptance**

The work will be accepted for payment provided it has been built in conformance with the drawings and specifications pertaining to the segment involved and is approved by the Engineer.

#### **Measurement**

Where minor structures are to be paid under this item they will be measured in cubic

meters of concrete required for the structures specified or as shown on the drawings. The single measurement of cubic meters shall include for all necessary works to provide the complete structures as designed/shown on the Drawings, including excavation and backfilling, formwork, concrete, reinforcement, curing and finishing.

#### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
50401	Miscellaneous minor concrete structures	Cubic Metre

***CHAPTER 505. NOT USED***

***CHAPTER 506. NOT USED***

***CHAPTER 507. NOT USED***

***CHAPTER 508. KERBS***

#### **508.01. Introduction**

This chapter covers the requirements for the construction of kerbing. Two types of kerbs are foreseen and are shown on the drawings.

- Type 1 – a high type kerb is for urban areas;
- Type 2 – a the low type kerb is for rural areas. The low kerb is intended primary for use as a drainage kerb to prevent uncontrolled discharges of surface water across shoulders and embankments.

#### **508.02. Materials**

1. Precast concrete kerb units of the quality and dimensions are shown on the Drawings. Where kerbing is required to follow a curve having a radius of less than 10 metres then purpose made radiused kerbs shall be fabricated. Kerbs shall be made from concrete having a maximum aggregate size of 20mm and a minimum compressive strength of 35 N/mm<sup>2</sup> at 28 days.
2. Portland cement mortar in accordance with Sub-Clause 504.02 above, as required.
3. Backing concrete having a maximum aggregate size of 40mm and a minimum compressive strength of 20 N/mm<sup>2</sup> at 28 days.

### **508.03. Generalities**

Any necessary excavation and backfill shall be performed in accordance with the requirements of chapter 203.

Forms shall be so designed and of sufficient strength that there is no loss of shape, bulging or warping under site conditions or concrete pressure, and such that they permit ready removal without causing damage to the concrete.

Forms shall be of wood, metal, or other suitable material. They shall be kept clean and coated with form release agent or form oil before placing concrete.

### **508.04. Placing kerbs**

Backing concrete shall be placed in situ in two casts. The initial concrete shall be cast to provide a bed at least 150mm in thickness with its upper surface between 5 and 15mm below the required level for the base of the PC kerb units. The bed shall be wide enough to project at least 50mm in front of the kerb units and 200mm behind the kerb units. The upper surface of this bed shall be left rough in order to provide an adequate key for subsequent operations.

Kerbs shall be placed on this foundation with a cement mortar bedding to bring them precisely to design line and level. Kerbs shall be jointed with cement mortar.

When the mortar bed has hardened, backing concrete shall be poured behind the kerbs to a level not less than 50mm below the top of the kerb and not less than 150mm in thickness behind the kerb. These dimensions for backing concrete shall take precedence over any backing concrete dimensions indicated in the drawings. The rear face of this backing concrete shall be contained with formwork.

The correct type of kerb for the location shall be as scheduled on the drawings and/or directed by the Engineer.

### **508.05. Curing Concrete**

The precast kerbs shall be carefully cured during production to ensure that the full strength of the concrete is reached. PC concrete kerbs shall not be allowed to dry out at all until 28 days after casting. These requirements may be reviewed if the units are produced in a dedicated PC plant with approved steam curing facilities.

Backing concrete shall be cured with wet burlap for 7 days after placing. Alternatively, by agreement with the Engineer, backing concrete may be cured by burying and watering.

### **508.06. Works Acceptance**

The work will be accepted for payment providing that they have been constructed entirely in conformance to the drawings and specifications pertaining to the segment involved and are approved by the Engineer.

#### **Measurement**

The linear metre measurement will cover all works necessary, including any excavation, trimming or backfilling, to place the kerbs and backing complete, as specified.

#### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

No.	Item	Unit of Measure
50801	Precast concrete kerbing and backing	Linear Metre

## **CHAPTER 509. DRAINS, MANHOLES, EXIT GULLY**

### **509.01. Introduction**

This type of works includes the construction of drains and filling the drain with drainage material, construction of manhole and exit gully.

### **509.02. Materials**

Materials have to be in accordance to:

Coarse sand	SM GOST 8736-93
Crushed granite	SM GOST 8267-93
Polyethylene pipe „SL”	GOST 18598-83
Gravel mix with sand	SM GOST 25607-94
Manhole gully	SM GOST 3634-99

#### **Geotextile filter membrane**

Shall be an approved mechanically bonded continuous filament nonwoven fabric of 100% UV stabilised polypropylene. It shall have a minimum strength in any direction of 7.5 kN/m; a minimum permeability of 100 litres/m<sup>2</sup>/sec, and a minimum thickness of 0.9mm and a minimum density of 100 gm /m<sup>2</sup>. It shall have a maximum opening size of 110 microns. Samples and test results of proposed material shall be submitted to the Engineer for approval before any filter fabric material is purchased or brought onto the site.

### **509.03. Working conditions**

Foundations will be made of sand and crushed granite with 40-70 mm particle size. Assembly of the pipes will be done according to SNiP 3.07.03-85 and SNiP 3.05.05-84.

At the bottom of the slope will be built a waterproofed screen. The pipes will be covered with gravel 40-70 mm/crushed granite 20-40mm. Each course will be 15 cm thick/gravel and sand/geotextile course/ clay soil 0,5m deep.

Manholes will be located where the trench is changing direction or declivity. On the continuous sectors manholes will be placed at each 50m apart. In these locations the trenches will be wided and deeped 0,5m, the walls will be consolidated with protection panels.

The manhole will be founded on a base made of compacted gravel. The position of the

down pipe will be shown. The pipe edge will be paint with cement mortar. The pipe will be provided with holes for the assembly of drainage pipes; the joints will be filled with cement mortar. The manhole will be covered with the cover. At the exit point will be built the exit hole. The foundation pit will be made transversal. The depth will be 0,8m, the length - 3,5m.

#### **509.04. Works Acceptance**

Tolerances should be not more than:

- longitudinal declivity (slope) +0,0005
- transversal dimensions +5cm;
- bottom trench level +5cm;
- Thickness of the filtering courses +10%.

#### **Measurement**

Unit of measure: linear meter

#### **Payment**

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
50901	Construction of the filter drain	Linear Metre
50902	Construction of the silt trap	Number
50903	Construction of the manhole	Linear meter
50904	Manhole cover of cast iron	Number

## **6. INCIDENTAL CONSTRUCTION**

### **CHAPTER 601. GUARDRAIL**

#### **601.01. Introduction**

This work comprises the provision and erection of W-beam galvanized steel guard rail.

#### **601.02. Materials**

Material shall conform to the following Section and Subsections:

- Concrete Chapter 504
- Galvanized steel rail SM GOST 26804-86, and provisions of this Chapter
- Paint for guardrail  
If required on the drawings or indicated elsewhere in this specification Guardrail shall be painted as shown. Paint shall conform to the requirements of Sub-Clause 014.02 of this Specification; however the following preliminary treatment shall be applied:

#### **601.03. Working conditions**

##### **Surface Preparation**

Galvanized surfaces shall be thoroughly scrubbed down using an approved galvanized iron cleaner to remove all traces of any resin protective coating or other protection.

The surface shall be washed down and scrubbed to remove all traces of grease, oil, dirt, etc.

##### **Priming**

Two coats of calcium plumbate primer shall be applied to dry film thickness of at least 0.025 mm.

The undercoat and balance of the approved paint system shall follow within one week of the primer.

Guardrail installation shall conform to SM GOST R52289:2009 and SNIP 2.05.02-85.

#### **601.04. Guardrail Supplementary Requirements**

All guard rail posts shall be metal. All guard rail installation shall include spacer blocks which ensure that the face of the guard rail is held at least 250 mm clear of the face of the post.

All metal guard rails, spacers, posts and fixings shall be galvanised. A hot-dip (galvanised) zinc coating that complies with the requirements of AASHTO M232 for coatings on Type A articles shall be applied to all rails, posts and spacers. All bolts, nuts and washers shall have a hot-dip (galvanised) zinc coating that complies with the requirements of AASHTO M232 for coatings on Type C articles. Galvanized guard rails shall not be nested when stacked for storage.

Guard rails and posts shall be supplied together with all bolts, nuts, washers and fixing materials required including bolts for fixing to posts and for fixing spacer blocks.

Dimensions of guard rails and terminal sections shall be as shown on the Drawings. If the Contractor's preferred guard rail supplier is unable to provide items precisely in accordance with the requirements he shall propose an alternative to the Engineer for approval. The Engineer's approval shall be conditional on being satisfied that the proposal is at least the equal of the specified detail in terms of both function and quality.

#### **601.05. Posts.**

When the edge of the pavement is within 1 metre of the guardrail post locations the posts shall be set before placing the pavement.

Guardrail posts shall be maintained at the length shown on the drawings as a minimum. If the Drawings show guardrail posts set into concrete they shall be so set. If no direction is given, guard rail posts may drive directly into the ground. If direct driving is impossible due to hard ground, posts may be set using pilot holes that are punched or drilled. The dimensions of the pilot hole shall not exceed the dimensions of the post.

The recommended method of erection to meet the tolerance requirements set out below is to set out and excavate holes, place posts in position, attach spacers and rails and block the whole assembly into its final position. This procedure allows precise positioning of the elements. When the assembly is set up true to line and level with no visible deformities, place concrete in the hole, being careful not to disturb the prealigned rail.

#### **601.06. Rail Elements.**

The rail elements may be installed before or after the pavement adjacent to the guardrail is complete. Do not modify specified hole diameters or slot dimensions.

##### **Steel rail**

Shop bends all curved guardrails with a radius of 45 metres or less. The overlap of the elements shall be made in the direction of the traffic. Use bolts which extend beyond the nut not less than 6 mm but no more than 25 mm. Tighten all bolts.

#### **601.07. Removing and Re-installing Guardrail.**

The work of removal of the existing guardrail, posts, and appurtenances and delivery to the designated storage area of the Employer or, if designated for re-use, to the Contractor's store is covered in the provisions of Chapter 103.

For rail that is to be re-used the Contractor shall replace all guardrail, posts, and hardware damaged during removal, storage, or re-installing.

Guard rail for reuse shall be refurbished prior to reuse. Refurbishment shall comprise:

- Taking designated elements from storage
- Transport to the site of refurbishment
- Straightening and reshaping
- Building up and re-drilling of all deformed or damaged bolt holes to provide standard 8 bolt coupling
- Grit blasting to bare metal
- Painting as directed



- Resetting shall comprise:
- Transport to site
- Erection at site in accordance with all the requirements of the foregoing clauses.

Immediately after grit blasting all exposed steel surfaces shall be given a full coat of zinc rich, epoxy based cold galvanising compound followed by two coats of calcium plumbate primer applied to dry film thickness of at least 0.025 mm. The undercoat and balance of the approved paint system shall follow within one week of the primer. Re-erection shall be done using all new bolts and nuts, hot dip galvanised to the same specification as that for new guardrail fastenings.

Where the Engineer considers that existing guardrail which must be dismantled for the execution of the works is sufficiently new and in good enough condition that it does not require refurbishment he may instruct that the rail be re-installed without refurbishment.

### **601.08. Guard rail finished alignment**

Finished guard rail shall be true to line and level within +/- 10mm at all points. However, in addition, when viewed from any position there shall be no visible irregularity in the horizontal or vertical alignment of the guard rail, the rail must flow in straight lines or smooth continuous curves. If there are visible deficiencies in this respect the guard rail shall be adjusted to correct, even if the rail is within the nominal tolerances.

### **601.09. Works Acceptance**

The work will be accepted for payment providing that it has been built in conformance to the plans and specifications pertaining to the segment involved and is approved by the Engineer.

#### **Measurement**

Guardrail will be measured in linear metres along the face of the rail including terminal sections.

Refurbishing and re-installing guardrail and raising guardrail will be measured in linear meter along the face of the rail. Replacement posts (except replacement posts for posts damaged by construction operations) used in the re-installing of guardrail will be measured by number.

Separate measurements shall be made for guardrail which is refurbished and re-installed and for guard rail which is reinstalled without refurbishment.

The dismantling of guard rail is measured under chapter 103.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
60101	Install new galvanised steel double-sided guardrail, type 11 DOMJ.	Linear Metre
60102	Install new galvanised steel single-sided guardrail, type 11 DOMJ.	Linear Metre
60103	Re-install existing steel W beam guard rail without refurbishment	Linear Metre
60104	Refurbish and re-install existing steel W-beam guard rail	Linear Metre
60105	Provide new posts for re-set Guardrail	Number

**CHAPTER 602. NOT USED**

**CHAPTER 603. NOT USED**

**CHAPTER 604. NOT USED**

## **7. ROAD MARKING AND SIGNING**

**CHAPTER 701. PERMANENT TRAFFIC CONTROL**

### **701.01. Introduction**

This work consists of constructing permanent traffic control signs, supports, kilometre and marker posts and any other required markers.

### **701.02. Materials**

Material shall conform to the following:

- All sign panels shall be manufactured according to SM GOST R52289:2009
- Posts are to be manufactured according to Typical Album Serial # 3.503.1-89.
- Concrete to be according to Section 504.

### **701.03. Generalities**

Furnish traffic control devices according to SM GOST R52289:2009, Technical Methods of Organizing Traffic Movement. Submit the sign list, details of non-standard signs and details of all marker posts for approval to the Engineer before ordering. The design of traffic signs and their installation shall be approved by the Road Police.

#### **701.04. Sign Supports**

Sign locations and marker post locations as shown on the drawings may be changed in agreement with the Engineer to fit the field conditions. Determine the lengths of posts at time of setting out.

Drive new supports (posts) with a suitable driving head or set supports in drilled or punched holes on foundation according to typical Album (standard drawings) 3.503.9-80.

Existing supports (posts) have to be thoroughly cleaned and painted with an approved zinc rich epoxy prime, followed by two coats undercoat and one finishing coat of an approved paint system.

Construct concrete footing according to Section 504.

#### **701.05. Sign Panels**

Road sign panels to be installed on posts in accordance with Album # 3.503.9-80.

Mounting of individual signs consisting of prefabricated panels may be made at the place of installations.

Do not field drill holes in any part of the panel. Use anti-theft fasteners where possible. Paint all bolt heads, screw heads and washers that are exposed on the sign face. Match the colour of the paint to the colour of the background area at the point where the fitting is exposed.

If a sign message is not applicable at the time of erection, completely cover the face of the sign with an opaque material.

Maintain the covering in good condition until the message becomes applicable. Do not use adhesive tape on the face of a sign.

Repair or replace damaged parts including reflective sheeting

#### **701.06. Marker Posts and Kilometre Posts**

Marker posts and kilometre posts shall be constructed and installed at the correct locations in accordance with the standard drawings and appropriate national standards.

#### **701.07. Works Acceptance**

The work will be accepted for payment providing that it has been built in conformance with the drawings and specifications pertaining to the segment involved and is approved by the Engineer.

##### **Measurement**

Sign installations will be measured by number. A sign installation includes the support. Different items will be used for significantly different signs.

Each sign in a multiple configuration will be measured.

Road side marker posts and kilometre posts will be measured by number.

##### **Payment**

The works measured as indicated above and certified by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
70101	Install new signs on existing metallic gantry	Number
70102	Install new signs on existing supports (posts)	Number
70103	Install new kilometre posts	Number
70104	Install new marker posts	Number
70105	Install new signs on new supports(posts), including installation of posts	Number

## **CHAPTER 702. PERMANENT ROAD MARKINGS**

### **702.01. Introduction**

This Section covers the technical conditions and requirements for road marking, in compliance with SM GOST R 51256:2009, SM GOST R 52575:2011 and technical requirements for traffic on public roads.

For safety reason, road marking should be necessarily performed using fine beads for night-time visibility.

Permanent marking lines are markings with a warranted service life and are performed using material of white colour.

Temporary marking lines are markings with no warranted service life and are performed, as a rule, using material of yellow colour.

### **702.02. Materials**

#### **a) General**

The material to be used for road marking and striping shall be an approved road marking paint applied to the pavement by mechanical means and reflectorised by the application of glass beads (ballotini) sprayed onto the wet paint during the application process.

Following application and drying, the material shall produce an adherent reflectorised stripe of specified thickness and width capable of resisting wear by traffic.

- 1) **Air drying paint based on organic solvent** of white or yellow colour, forming a membrane when it gets dry.
- 2) **Air drying paint based on solvent and water (ecological)**, of white or yellow colour, forming a membrane when it gets dry.
- 3) **Air drying paint of plastic type based on solvent and water (ecological)**, of white colour.
- 4) **Cold applied material of 2 components**

- 5) **Hot applied thermoplastic**, applied at temperatures between 180<sup>0</sup> C and 200<sup>0</sup> C, at thicknesses between 2000 – 4000 µm, on newly laid or old bituminous surfaces, with no distress, on cement concrete surfaces using a primer, or on top of specific types of marking paint. This kind of material is used in the form of a membrane continuous marking or in the form of a structure of different patterns, having a strong rumble effect.  
Thermoplastic materials ensure visibility during day-time and night-time, during dry weather and rainy weather. These products contain glass beads, but for a better reflectory effect after application small beads are applied on the surface of the marking.  
The quality of these products and hardening time is determined based on data sheets supplied by manufacturer, minimal life time being of 2 years.
- 6) **Plant produced products** for road marking, consisting of elements, which are to be assembled and are hot applied, of 3000 µm thickness, on newly laid or old bituminous surfaces, in good condition, on top of thermoplastic in good condition and on top of cement concrete surfaces using primer.  
These products have embedded beads, but for a better reflectory effect after application glass beads are used.  
These marking products ensure visibility during day-time and night-time, during dry weather and rainy weather.  
These marking products shall also create a rumble effect.

**Note: Reflectory Coefficient, luminance, and colour range defined by chromatic coordinates for road marking, white and yellow, will be as stimulated in SM GOST R 51256:2009.**

Fine or coarse glass beads may be used as such, but also in a mixture with beads for skid-resistance.

#### **b) Road Paint**

Paint shall meet the requirements of SM GOST R51256:2009 for Ready-Mixed White and Yellow Traffic Paints. The drying time shall not be more than 30 minutes.

All paint shall be shipped in strong containers plainly marked with the weight per gallon, the volume of paint content in gallons, the colour, lot, batch and code number. A true Statement of the % composition of the pigment, the proportion of pigment to vehicle, and the name and address of the manufacturer also shall be shown.

Any paint which, although inspected and approved at the point of manufacture, hardens or livers in the containers so that it cannot be readily broken up with a paddle to a smooth, uniform painting consistency, will be rejected. Any paint too thick for proper brush application will be rejected, even though it conforms to these Specifications in all other respect. Paint shall be used as supplied; under no circumstances will thinning of paint be permitted.

All paints shall be delivered to the project completely mixed, and ready to be used without additional oil or thinner.

#### **c) Colour**

The thermoplastic material shall be available white colour and, if required by the Drawings, in yellow.

- (i) White - the colour of white markings shall match the colour No. 00E55 of BS 4800. Pigment shall be Titanium Dioxide complying with BS 1851.

- (ii) Yellow - the colour of yellow markings shall match the colour No. 08E51 of BS 4800.

**d) Glass Beads**

Fine or coarse beads, anti-skidding beads must be compliant with SR-EN-1423/A1:2004. The quantity of beads to be used shall be as directed by the Employer's Representative on the basis of demonstration tests to be done by the Contractor but shall not be less than 0.8 kgm/litre of paint.

**e) Test Certificates**

The Contractor shall submit, for each consignment of paint and of ballotini delivered to site, the Manufacturer's certificate to show that the materials comply in all respects with the relevant product specifications.

At least 21 days before starting pavement marking application, the Contractor shall furnish a written copy to the Engineer of the marking manufacturer's recommendations for use. A field demonstration may be required to verify the adequacy of recommendations.

Marking material shall be transported in appropriate containers plainly marked with the following information as appropriate for the material being furnished:

- Manufacturer's name and address
- Name of product
- Lot/batch numbers
- Color
- Net weight and volume of contents
- Date of manufacture
- Date of expiration
- Statement of contents,
- Mixing proportions and instructions if mixing of components is required.
- Safety information

### **702.03. Application of Road Markings**

**a) Preservation of Existing Marking Patterns**

Where existing and final pavement marking locations are identical, stake the limits of all existing pavement markings (no-passing zones, edge stripes, etc.) before any pavement work. Upon completion of the final surface course, establish line limits for the new pavement for approval before marking. Establish markings according to SM GOST R51256:2009.

**b) Weather Limitations**

Road marking material shall not be applied to a damp surface or when the relative humidity exceeds 80%, or at temperatures lower than 10°C, or when in the opinion of the Engineer, wind strength is such that it may adversely affect the application operations.

**c) Mechanical Equipment for Application**

The equipment shall consist of an apparatus to clean the surfaces, a mechanical road painting machine and all additional hand-operated equipment necessary to complete the work. The mechanical road marking machine shall be capable of painting at least two lines simultaneously and shall apply the paint to a uniform film thickness at the rate of application as specified. The machine shall be so designed that it will be capable of painting the traffic markings to a uniform width

with sides within the tolerances specified hereinafter, without the paint running or splashing. The machine shall further be capable of painting lines of different widths by adjustment of the spray jets on the machine or by means of additional equipment attached to the machine. The machine shall be equipped to spray ballotini onto the wet paint during the laying operation at the required rate as agreed with the Engineer.

The machine shall be capable of spraying at a speed of not less than 5.0 km/h.

**d) Surface Preparation**

Traffic markings shall be applied to bituminous surfaces only after sufficient time has elapsed to ensure that damage will not be caused to the surface by volatile substances evaporating from the bituminous surfacing and after the surface has been sufficiently trafficked to expose an appreciable proportion of aggregate in the surface. In no case shall traffic paint markings be applied until at least 2 weeks after the completion of the bituminous surfacing or any longer period required by the Engineer.

Before the material is applied, the surface shall be clean and dry and completely free from soil, grease, oil, acid or any other material which will be detrimental to the bond between the marking material and the surface. The portions of the surface where the marking is to be applied shall be properly cleaned by means of watering, brooming or compressed air if required.

Where road markings are to be applied on a concrete pavement, all laitance and loose curing compound shall be removed. Particular care shall be taken to expose a surface of fresh concrete on all areas where road studs are to be fixed.

**e) Setting Out of Road Markings**

The lines, symbols, figures or marks shall be set out by means of paint spots of the same colour as that of the proposed final lines and marks. These spot marks shall be at such intervals as will ensure that the traffic markings can be accurately applied, and in no case shall they be more than 1.5 m from each other. Normally, spots of approximately 10 mm in diameter should be sufficient.

The dimensions and positions of traffic marking shall be as shown on the Drawings or as specified in the national regulations for traffic signs and markings.

After spotting, the positions of the proposed road marking such as dotted lines and starting and finishing points of barrier lines are to be indicated on the road. These pre-markings must be approved by the Engineer prior to the commencement of any marking operations.

The positions and outlines of special markings are to be produced in chalk on the finished road and must be approved by the Engineer before they are applied. The use of approved templates will be permissible on condition that the positioning of the marking is approved by the Engineer before application is commenced.

The position of road studs shall be marked out on the road and shall be approved by the Engineer before they are fixed in position.

The Contractor shall be responsible for all setting out of road marking as agreed with the Engineer.

#### **702.04. Construction Requirement**

The road marking material shall be applied as figures, signs, letters, symbols, broken or unbroken lines or other marks, as shown on the Drawings or directed by the Engineer.

The marking material shall be applied by means of a machine; it shall be applied in one layer. Before the road marking machine is used on the permanent works, the satisfactory working of the machine shall be demonstrated on a suitable site which is not part of the permanent works. Adjustment to the machine shall be followed by further testing. Only when the machine has been correctly adjusted and approved by the Engineer may the machine be used on the permanent work. The operator shall be experienced in the use of the machine. The rate of application shall be checked and adjusted if necessary before application on a large scale is commenced and daily thereafter.

Where two or three lines are required next to each other, the lines shall be applied simultaneously by the same machine. Before and during application, in storage, preparation, mixing and application, the marking material shall be treated at all times in accordance with the manufacturer's instructions. Paint shall be applied without the addition of thinners.

Where, under special circumstances, painting is done by hand, it shall be applied in two layers, and the second layer shall not be applied before the first layer has dried out sufficiently. As most road marking paint reacts with the bitumen surface of the road, the paint is to be applied with only one stroke of the brush or roller at any one point on the road.

Ordinary road marking paint shall be applied at a nominal rate of 0.42 l/m<sup>2</sup>, or as directed by the Engineer, and proprietary brand paints shall be applied at the rates specified by the manufacturer subject to the approval of the Engineer who may require higher rates of application following field trials. Thermoplastic road marking material shall be applied at a nominal rate of 5 kg/m<sup>2</sup> on asphalt concrete and 6 kg/m<sup>2</sup> on surface dressing.

Retro-reflective glass beads shall be applied by means of a suitable machine forming a part of or attached to the road marking machine immediately after the application of the paint in one continuous operation. The rate of application of the beads shall be 0.8 kg/litre paint or such other rate as is specified in the contract or agreed with the Engineer. Machines which apply the beads by means of gravity only shall not be used. The beads shall be sprayed onto the paint layer.

Each layer of marking shall be continuous over the whole area being marked.

Apply pavement markings in the direction of traffic according to SM GOST R51256:2009. Apply all markings to provide a clean – cut and workmanlike appearance by day or night.

#### **702.05. Protection**

After the application, the traffic markings shall be protected against damage by traffic or other causes. The Contractor is responsible for the erection, placing and removal of all warning boards, flags, cones, barricades and other protection measures which may be necessary.

Marked areas shall be protected from traffic until the markings are dried to no-tracking condition. The Contractor shall remove all tracking marks, spilled marking material, markings in unauthorized areas, and any defective markings.



## **702.06. Tolerances**

Road traffic markings shall be applied with an accuracy complying with the tolerances given below:

### **a) Width**

The width of lines and other markings shall not deviate from the specified width by more than 5%.

### **b) Position**

The position of lines, letters, figures, arrows, retro-reflective road studs and other markings shall not deviate from the true position specified by more than 20 mm.

### **c) Alignment of Markings**

The alignment of any edge of a longitudinal line shall not deviate from the true alignment by more than 10 mm in 15 meter.

### **d) Broken Lines**

The length of segments, both of line and of break of broken longitudinal lines shall not deviate from the specified length by more than 150 mm.

In broken lines, the length of segments and the gap between segments shall be as indicated on the Drawings or as directed by the Engineer.

Lines lying on curves, whether broken or unbroken, shall not consist of chords but shall follow the correct radius.

## **702.07. Faulty Workmanship or Materials**

If any materials not complying with the requirements are delivered to the Site or used in the Works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer, at the Contractor's own cost. Rejected traffic markings and paint or marking material that has been splashed or has dripped onto the surfacing, kerbs, structures or other such surfaces shall be removed by the Contractor at his own cost, in such a way that the markings or spilt paint will not show up again later and the underlying bituminous surfacing is not damaged in any way.

## **702.08. Works Acceptance**

The work will be accepted for payment providing that it has been executed in conformance to the drawings and specifications pertaining to the segment involved and is approved by the Engineer.

### **Measurement**

Road marking lines shall be measured by the linear metre for each width of line and words and symbols shall be measured by number or by the area of marking. Alternatively the complete road markings may be measured by the actual area of marking required to be applied expressed in square metres.

### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter including the cost of any priming coat required to comply with the manufacturers specifications, paint, cleaning,

application, ballotini, stencils, setting out, temporary signs, barriers, all traffic control and making good.

Payment will be made under the item below:

No.	Item	Unit of Measure
70201	Road markings (paint)	Square Metre

## **CHAPTER 703.        SIDE WALKS**

### **703.01.        Introduction**

This type of works consists of constructing new sidewalks and/or surfacing the existing sidewalks with new asphalt concrete or cement concrete as directed.

### **703.02.        Materials**

Materials, items, and structures used for the works under this Section should meet the following requirements.

- Sand asphalt concrete mix and materials SM STB 1033:2008
- Aggregate for side - walk foundations SM GOST 8267 - 93
- Stairway structures according to the project
- Cement-sand mixture according to the project
- Concrete Paving Blocks according to the project

Material for concrete sidewalk (if concrete is used for constructing sidewalks) should be in accordance with Chapter 504 and, where kerbs are used, they shall be in compliance with Chapter 505.

### **703.03.        Construction of side walk**

The works relating to constructing new sidewalks and/or new asphalt concrete surfacing are to be performed at the same time as pavements of the main roadways are being installed. When kerbs are required between the sidewalk and the roadways, placing kerbs should be performed before constructing the upper pavement layers and sidewalks.

Earth works relating to sidewalks should be in accordance with Chapter 201.

New side-walk pavement consisting of macadam foundation and sand asphalt concrete mix surface for sidewalks should be carried out in accordance with Chapter 306 for the macadam base and Chapter 311 for the asphalt surface. The contractor's equipment should be capable of constructing side-walk pavement of design width (1.00 - 1.50 m).

#### **703.04. Repair of sidewalk**

Where directed by the Engineer the Contractor shall repair existing sidewalks by removing loose asphalt material and resurfacing with a 40mm layer of new sand asphalt mix for sidewalks.

#### **703.05. Works Acceptance**

The works under this Section are accepted in accordance with Sub-Clause 002.04 and providing that they are carried out according to the Project requirements, Drawings and Specifications and receive the Engineer's approval.

##### **Measurement**

Works relevant to construction of new sidewalks and asphalt concrete surfacing will be measured (at design thickness of pavement courses or by actual thickness accepted, whichever is the lower) by area or by volume in accordance with the units designated in the bill item. Works relating to construction of stairways will be measured by length of stairway

##### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule.

The payment under these items shall be the whole of the payment due for the completion of all.

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
70301	Repair of existing sidewalk with asphalt concrete	Square Metre
70302	Construction of new sidewalk with asphalt concrete surface	Square Metre
70303	Construction of new sidewalk with cement concrete surface	Square Metre
70304	Construction of new sidewalk with concrete Paving Blocks	Square Metre

### **8. ENGINEERING SERVICES**

**CHAPTER 801. NOT USED**

**CHAPTER 802. NOT USED**

**CHAPTER 803. NOT USED**

**CHAPTER 804. NOT USED**

**CHAPTER 805. NOT USED**

## **9. LANDSLIDE REMEDIAL WORKS**

### ***CHAPTER 901. EARTHWORK***

#### **901.01. Introduction**

In general the earthworks required for landslip remedial works will be executed in accordance with the requirements of Chapters 102 and 201. Because of the nature of the work and the additional control of materials required, measurement and payment for the works will be made under the items listed below which are specific to slip remedial works.

#### **901.02. Materials**

Materials for embankment construction shall comply with the requirements of SNiP 2.05.02-85 and with the provisions of chapter 201 and this chapter generally.

#### **901.03. Excavation**

Topsoil shall be stripped and stockpiled for reuse in accordance with the provisions of chapter 102. Material excavated from the top of the existing road embankment shall be excavated to the depths shown on the Drawings and shall be used for the provision of new counterberms at the toe of the embankment

Slipped material shall be excavated to the shapes, lines and levels shown on the Drawings or directed by the Engineer. Slip material shall be classified as unsuitable unless specifically directed otherwise and shall be run to spoil in accordance with the provisions of chapter 201. Any material classified as suitable shall either be used in the construction of counterberms and other miscellaneous embankment works in the slip area or shall be run to spoil as surplus to requirements.

Slip material is removed to disposal and it is not used rather than for fill of ravines, in agreement with authorities responsible for use of land.

#### **901.04. Excavation in borrow pits**

The material required for the construction of replaced road embankment shall be supplied by the Contractor from borrow pits, in accordance with the provisions of Chapter 201. In this instance however, such borrow material shall have a minimum CBR value of not less than 6%.

#### **901.05. Construction of embankment on a slope more than 1:3**

In order to construct new embankment on slopes exceeding 1:3 or where indicated on the Drawings, benches shall be cut. The dimensions of benches shall generally be in accordance with the details shown in the Drawings; however, variations to the dimensions of benches may be permitted by agreement with the Engineer to facilitate excavation works and use by construction traffic. Whether modified or not benches shall always be continuous; i.e. the vertical face of one bench will intersect with the horizontal step of the next bench. Material from benches may be used in counterberms and miscellaneous embankment if suitable.

#### **901.06. Embankment construction**

Embankment construction and compaction shall generally be in accordance with the requirements of chapter 201. New embankment to replace that removed beneath the existing road shall be formed entirely from borrow material with CBR > 6%. Note that filling to the top of

the road embankment must be placed in conjunction with layers of geotextile reinforcing fabric as shown in the Drawings.

Counterberms and other miscellaneous areas of embankment in the slip area shall be formed using material excavated from the top of the existing road embankment and from any other material arising from slip and bench excavation which is classified as suitable for this use.

Prior to placing the new material for the top of the road embankment the upper surface of the excavated material on which the new upper embankment is to be constructed shall be deeply scarified and thoroughly compacted to a depth of not less than 400mm. After compaction the density of the compacted soil for the full depth shall be not less than 95% of the maximum density at optimum moisture content.

#### **901.07. Geotextiles**

Geotextile reinforcement to embankments and geotextiles to drainage works, as specified in chapter 902, shall be placed as shown in the drawings.

#### **901.08. Subsurface Drainage**

Subsurface drains shall be installed as shown in the drawings and shall be constructed as specified in Chapter 905.

Manholes to subsurface drains shall be provided as shown on the drawings.

Subsurface drains shall be measured and paid as set out in Chapter 905.

#### **901.09. Finishing of Slopes**

Slopes shall be trimmed and finished true to line and level in accordance with the requirements of chapter 204. After shaping, slopes and other surfaces designated for revegetation shall be spread with topsoil and seeded or planted with grass and shrubs in accordance with the requirements of chapter 204. The works of trimming, top soiling and seeding or grassing shall be measured and paid under the relevant items of the Earthworks Bill.

#### **901.010. Subgrade**

The top of the finished embankment shall be finished to subgrade standard in accordance with the requirements of chapter 201.13 to form the base for the reconstructed pavement.

#### **Measurement**

The various items of earthworks under slip remedial earthworks shall be measured throughout in net cubic meters except for the compaction of embankment prior to placing new material which shall be measured in square meters. The works of trimming, top soiling and seeding or grassing shall be measured and paid under the relevant items of the Earthworks Bill.

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule.

The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under some or all of the items below:

No.	Item	Unit of Measure
90101	Excavation in all materials other than concrete including slipped soil and benches with material run to spoil or used in counterberms and miscellaneous embankment works	Cubic meter
90102	Excavation in top of existing road embankment with material run to counterberm or to spoil	Cubic meter
90103	Provide material for new road embankment from borrow pits with soaked CBR > 6%	Cubic meter
90104	Construct road embankments with material from borrow including working with geotextile layers	Cubic meter
90105	Compaction of upper surface of road embankment after excavation and prior to placement of borrow material	Square meter

## **CHAPTER 902. GEOTEXTILE FABRICS**

### **902.01. Introduction**

The works under this chapter comprise the provision and placing of geotextile fabric for the reinforcement of embankment soils and for use as filter media in drainage works.

### **902.02. Materials**

#### **GEOTEXTILE Type 1 Geotextile for transverse subsurface drainage**

This must be a mechanically bound material in a continuous way of 100% polypropylene, UV stabilized, of highly resistant fibres of an approved inert material, manufactured by a specialized producer of geosynthetical products as per ISO, and compliant with the following requirements:

Properties	[ Standard ]	UM	Parameters
Tensile strength, MD/CD	[EN ISO 10319]	kN/m	16/16 minimum
Elongation at max.load, MD/CD	[EN ISO 1031]	%	100/40 minimum
Static puncture strength (CBR-test)	[EN ISO 12236]	N	2.350 minimum
Cone drop test ( hole-Ø)	[EN ISO 13433]	mm	22 maximum.
Permeability vertical	[EN ISO 11058 - Δh = 50 mm]	l/m <sup>2</sup> s (mm/s)	90 maximum
Characteristic opening O <sub>90</sub>	[EN ISO 12956]	mμ	100 maximum

The material used for construction of transverse subsurface drainage must be the one recommended by the producer. Before the material is procured or supplied to the site to be used for construction of transverse subsurface drainage, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

#### **GEOTEXTILE Type 2.**

Geotextile used as a separating membrane, protection membrane for embankments and a filter membrane for protection of ravine slopes and bottom and for protection against erosion caused by runoffs.

This must be a mechanically bound material in a continuous way of 100% polypropylene, UV stabilized, of highly resistant fibres of an approved inert material, manufactured by a specialized producer of geosynthetical products as per ISO, and compliant with the following requirements:

Properties	[ Standard ]	Unit	Parameters
Tensile strength, MD/CD	[EN ISO 10319]	kN/m	29/30 minimum
Elongation at max.load, MD/CD	[EN ISO 10319]	%	100/40 minimum
Static puncture resistance (CBR-Test)	[EN ISO 12236]	N	4400 minimum
Cone drop test (hole-Ø)	[EN ISO 13433]	mm	13 maximum
Permeability vertical	[EN ISO 11058 - Δh = 50 mm]	l/m <sup>2</sup> s (mm/s)	55 maximum
Opening size O <sub>90</sub>	[EN ISO 12956]	mμ	90 maximum

The material used for stabilization of fine soil must be the one recommended by the producer. Before the material is procured or supplied to the site to be used for protection of embankments and slopes, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

The embankments and slopes shall be protected against scours caused by runoffs as shown on the Drawings.

#### **Geocomposite Type 1 for road pavement as SAMI (Stress Absorbed Membrane Interlayer)**

This must be a highly strong geocomposite material of continuous fibres of 100% polypropylene, UV stabilized, mechanically bound, reinforced with glass fibres, and manufactured by a specialized producer of geosynthetical products as per ISO.

The products used for road pavement must be compliant with the following requirements related to physical and mechanical properties:

Properties	[ Standard ]	Unit	Parameters
Tensile Strength	EN ISO 10319	kN/m	75 / 75
Strength at 2% strain	EN ISO 10319	kN/m	51 / 51
Bitumen retention	ASTM D6140-97	kg/m <sup>2</sup>	1.1
E-Modulus		MPa	81 000
Melting point	EN ISO 3146	oC	up to 400°C

The products to be used for road pavement, supplied by the producer, must be accompanied by a Quality Certificate and Method Statement, which must be submitted to the Engineer. The products must be supplied in protective packages against UV rays, abrasion and moisture.

Before the products are procured or supplied to the site to be used as a SAMI membrane for road pavement, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

**Filter Geocomposite Type 2 used for protection of banks, embankment slopes against erosion caused by waves and streams.**

This must be a mechanically bound material in a continuous way of 100% polypropylene, UV stabilized, of 2 continuous layers of nonwoven geotextile: one filter layer and a second protective layer against damage of the first layer, manufactured by a specialized producer of geosynthetical products as per ISO, and compliant with the following requirements:

Properties	[ Standard ]	Unit	Parameters
Flow rate in the plan, 20 / 100 kPa	[EN ISO 12958]	10-6 m <sup>2</sup> /s	4.0 / 1.1
Permeability normal to the plane	[EN ISO 11058 - Δh = 50 mm]	l/m <sup>2</sup> s (mm/s)	60 maximum
Opening size O <sub>90</sub>	[EN ISO 12956]	mμ	80 maximum
Tensile strength, MD/CD	[EN ISO 10319]	kN/m	23/23 minimum
Elongation at max. load, MD/CD	[EN ISO 10319]	%	85/75 minimum
CBR puncture resistance	[EN ISO 12236]	N	3300 minimum
Cone drop test	[EN ISO 13433]	mm	13 maximum.

Before the products are procured or supplied to the site to be used as a filter membrane, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

**Drainage Geocomposite Type 3.**

The geocomposite used as a draining membrane shall consist of a core material of high permeability, obtained from extruded synthetic monofilaments polypropylene, twisted and bound with 2 filter geotextiles, fixed on it at hot temperatures. The geocomposite will be placed in the area of a subdrain pipe intended to capture the water and to convey it to the proper direction, manufactured by a specialized producer of geosynthetical products as per ISO, and compliant with the following requirements.

Properties	[ Standard ]	Unit	Parameters
Thickness	[ EN ISO 9863-1 ]	mm	Min 8
Plane flow capacity - Soft/Rapid i=1 (90grad) Load 20kPa i=1 (90grad) Load 50kPa i=1 (90grad) Load 100kPa	[EN ISO 12958 ]	l/(m·s )	2,10 2,00 1,60
Opening size	[EN ISO 12956]	mμ	115 maximum
Tensile strength, MD/CD	[EN ISO 10319]	kN/m	6/7 minimum
CBR puncture resistance	[EN ISO 12236]	N	1125 minimum



Cone drop test	[EN ISO 13433]	mm	30 maximum
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Before the products are procured or supplied to the site to be used as a filter membrane, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

For slope protection and stability against erosions can be used confinement systems, as Geocells and Polymat (a 3D anti-erosion mattress).

Geocell is a product of polyethylene material of a high density, used on slopes, road embankment slopes, reducing hydraulic energy and limiting the stress inside and underneath the cells, increasing the original strength, protecting the root systems, serving as a directional means for the surface drainage, preventing the ravines, avoiding loss of moisture.

Polymat is a 3D mattress for erosion control of monofilament extruded polypropylene, UV stabilized, used on abrupt slopes, preventing soil erosion, stabilizing the surface soil layer and ensuring a permanent support required for growth of vegetation.

The products used for slope stability must be compliant with the following requirements, related to physical and mechanical properties:

### Geocell Confinement Systems

Properties	Parameters
Cell Distance between Weld Seams	356 mm ( $\pm 2\%$ )
Cell Wall Heights	100 mm
Cell Dimension (Expanded)	260 x 224 mm ( $\pm 3\%$ )
No. of Cells/m <sup>2</sup>	35

### Polymat – randomly arranged monofilaments

Properties	[ Standard ]	Unit	Parameters
Tensile Strength MD	EN ISO 10319	kN/m	1.8
Elongation		%	50
Tensile Strength CD	EN ISO 10319	kN/m	1.0
Elongation		%	50
Voids content		%	90
Mass per unit area	EN ISO 9864	g/m <sup>2</sup>	560

Before the products are procured or supplied to the site to be used for slope stability, the Engineer must be submitted for approval the patterns of material and the test results for the proposed patterns.

### 902.03. Handling and Installation

Materials shall be handled and stored in accordance with instructions supplied by the producer.

**Geotextile Type 1** shall be used for construction of transverse subsurface drainage. Geotextile shall be placed into the excavated trench with gravel and ballast on top.

Geotextile must be not less than the length of the drainage and must be so wide as to wrap the whole ballast fill as per Drawings.

**Geotextile Type 2** used as a separating membrane and for embankment stability must be placed on top of draining (capping) layer in the lay direction. Adjacent strips of reinforcement shall be joined together using producer's approved jointing systems to provide the full strength of the reinforcing mesh. Tensioning of the mesh across the embankment shall be in accordance with the producer instructions. Prior to laying the separating and reinforcing mesh in place, the working surface of the embankment shall have been completed to a smooth flat compacted. On completion of the mesh layer the succeeding layer of fill (shoulder fill), approximately 150mm in thickness, shall be laid and the base course of crushed stone, which will be compacted. The fill shall be at the OMC for compaction prior to placing. Shoulder fill at the land sliding side must be wrapped with geotextile as per Drawings.

**Geotextile Type 2** is also used as a filter membrane to protect the ravine slopes and bottom against erosions caused by runoffs. It will be placed after finished slopes and bottom, and shall be joint and fixed with an approved jointing system. A 500mm thick layer of boulder stone of 200-400mm sizes will be placed on top of geotextile.

**Geocomposite Type 1** is used as a SAMI layer for reinforcement and against cracks. The use of Geocomposite Type 1 is described in Chapter 303.

**Geocomposite Filter Type 2** used as a filter material to protect the banks, embankment slopes against erosion caused by waves and streams and must be laid on a finished surface, being pinned or stapled to the slope. It will ensure stability of soil particles allowing at the same time for water to freely drain. 500mm thick layer of boulder stone of 200-400mm sizes will be placed on top of geotextile.

#### **Drainage Geocomposite Type 3:**

Main application of drainage geocomposite is that one used for vertical drainage. High drainage capacity of the material coupled with a subdrainage pipe make it perfect to be used for draining trenches, retaining walls, reinforced areas and stability soil interventions.

The use of Geocomposite Type 3 is described in Chapter 905.

**Geocell Materials and Polymat Mattress** serve as an improvement of planted slopes with vegetation, increasing the rooting capacity, directing the draining waters on the surface of numerous cells, which serve as a control against development of hollows.

Geocells and Polymat Mattress are used in accordance with instructions supplied by the producer. If appropriate, the soil must be slightly compacted, removing the stones, roots and other obstructions.

### **902.04. Acceptance of Works**

#### **Measurement**

Geotextile and geocomposite fabrics shall be measured in square meters of placed material. No allowance will be made for overlaps, cutting, wastage, etc. and no additional payment will be made for any special handling, storage or transport requirements; all such shall be included in the basic rate.

There will be no special measurement and payment Geocomposite Type used as a SAMI for road pavement or for the Drainage Geocomposite used for filter subdrains. These materials will be included in the general measurement for SAMI layer according to Chapter 303, and Filter Subdrains according to Chapter 605.

## **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under the items below:

No.	Item	Unit of Measure
90201	Geotextile fabric Type 1 in reinforcement to Embankment	Square meter
90202	Geotextile fabric Type 2 as a filter membrane .	Square meter

## ***CHAPTER 903. NOT USED***

## ***CHAPTER 904. BORED PILES***

### **904.01. Introduction**

The works covered by this chapter comprise the construction of a slide retaining structure composed of a grid of bored piles linked at the top by a heavy reinforced concrete slab and includes: boring the holes, installing the reinforcement cage, casting the piles and capping connecting beam.

### **904.02. Materials**

Reinforcing steel will be reinforcement Type A-I, and Type A-III conforming to GOST 5781-82 \* and rolled steel sheets conforming to GOST 103-76\*

Concrete for piles shall conform to GOST 26633-91\*.

- The strength of the concrete shall exceed 110% of design strength.
- The cement proportion shall be 1.5-2 times more than design requirement.
- The water/cement ratio will not exceed 0.55 and the density of the finished concrete shall be 2.45-2.55 t/m3.
- The required plasticity and cohesion of the concrete will be achieved through the composition and if necessary, by the addition of plasticiser.
- The aggregate will be gravel or crushed stone with a maximum aggregate size of 40mm.

Concrete for other works shall conform to the requirements of GOST 26633-91\* and SNiP 3.06.04-91

Portland cement shall conform to requirements of GOST 10178-85\*

### **904.03. Piling**

The Contractor shall carefully set out the required locations and levels of all piles complete with well established reference points outside the area of the works which will be available throughout the period of construction. The setting out shall be verified and approved by the Engineer before any further works proceed.

Before drilling of pile holes, the Contractor shall have established a secure stable working platform for his equipment at the designated location.

Before any drilling of any holes, the Contractor shall have on site the complete prefabricated reinforcement cage required for those borings, ready for installed.

Drilling of pile holes shall be executed as rapidly as possible to minimise the possibility of borehole collapse. The Contractor shall be responsible for taking all necessary measures to avoid the collapse of boreholes based on the data available regarding ground water levels and soil types shown in the Drawings. The contractor shall use temporary steel casing, drilling fluid, or other measures to ensure that soil collapse does not occur.

If a pile location becomes unusable due to borehole collapse or any other reason associated with the execution of the works and a rearrangement of the piling becomes necessary in consequence, the contractor shall carry out any additional works required to implement such a revised arrangement.

As boring proceeds, waste from the operation shall be removed from the site and disposed of in accordance with the specification requirements. If the material is suitable it shall be run to store and reserved for use in embankment, otherwise it shall be disposed of as spoil material. Any slurry arising from the works shall not be discharged into watercourses but shall be settled until liquids and solids can be disposed of separately.

On completion of the hole it shall be inspected and approved by the Engineer prior to placing of the reinforcing cage. Reinforcing cages shall be checked prior to placing and marked by the Engineer as checked and approved.

Concreting shall begin as soon as possible after cage placement and shall continue without interruption until the casting is complete.

The concrete casting work will be done using a tremie pipe for placing concrete at depth and with vibratory equipment for compaction and concrete flow. The work will be stopped only for the removal of slurry, water or unsuitable concrete. In the top 3 metres of the piles additional compaction will be provided using a poker vibrator. Concrete placement shall be carried out so as not to move the reinforcement cage. The tremie pipe shall be raised gradually in stages such that the end of the pipe is always at the level of the placed concrete

#### **904.04.1. Capping Beam**

The rows of bored piles, together with any designated piles from previous operations on the site, shall be connected with a substantial, in situ, reinforced concrete slab.

The dimensions, concrete and reinforcement of this slab shall be in accordance with the drawings and the Specifications.

The construction of the capping slab shall include the building up and trimming of the ground beneath the slab to form an adequate support at the correct level to act as a base on which to place the slab and shall include the provision of an impervious membrane to isolate the fresh concrete from the ground.

The works of the capping slab shall also include the cleaning, trimming and extension of all protruding reinforcement of new and existing piles to suit the dimensional requirements of the connecting slab and the details of the junction between piles and slab.

#### **904.04.2. Acceptance of Works**

The works will be accepted if they are in accordance with the Drawings and technical specifications, to the approval of the Engineer and conform to the following tolerances.

The holes shall not deviate from the specified dimensions by more than:

- Depth + 20cm; - any unauthorized additional depth will be at Contractor's cost,

- Diameter not less than nominal; any unauthorized additional width will be at Contractor's cost,
- Inclination of the vertical axis: not more than 2° from vertical;
- Pile location: not more than 75mm from design location in any direction.
- Pile vertical elevation: not more than +25mm-75mm

The deviation of the reinforcement cage, taking into account the diameter of the bars will not exceed:

- ✓  $\pm 10\text{mm}$  length;
- ✓  $\pm 0.5d$  distance between bars;
- ✓  $0.1d$  moved bars from the axis;
- ✓  $\pm 10\text{mm}$  displacement of the cage axis against the pile axis

#### **Measurement**

The whole work of the construction of bored piles shall be measured in linear meters of pile at the nominal dimensions authorized and shall include the boring of the hole, the disposal of material, the reinforcement cage, the concrete and all associated works.

The construction of the connecting slab shall be measured in cubic meters of concrete required to construct the slab at the nominal dimensions authorized and shall include construction of the base platform, impermeable membrane, formwork, reinforcement, concrete, curing and all associated works.

#### **Payment**

The works executed as indicated above and confirmed by the Engineer will be paid at the rate provided in the contract against the items shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all works indicated in the present chapter.

Payment will be made under the items below:

No.	Item	Unit of Measure
90401	Construction of bored piles $\varnothing 1.00\text{m}$	Linear meter
90402	Construction of bored piles $\varnothing 1.20\text{m}$	Linear meter
90403	Construction of Connecting Slab	Cubic meter

### ***CHAPTER 905. FILTER DRAIN, MANHOLES, EXIT GULLY***

#### **905.01. The works include:**

The works include: excavation the trench, construction of manholes, provision of a subdrain and filter medium, backfilling, construction of the exit gully.

#### **905.02. Materials shall be in accordance with:**

- ✓ coarse sand - GOST 8736-93\*
- ✓ crushed granite - GOST 8267-93\*
- ✓ gravel mixed with sand - GOST 25607-94\*
- ✓ manhole sections - GOST 3634-99
- ✓ Flexible draining pipes  $\varnothing 120-200$  - Compliance Certificate

✓ Geotextile as in Chapter 902

### **905.03. Working Conditions**

Before starting the excavation works of the trench setting out works should be performed first (setting out of trench axis, CLs for manholes)

Excavation of trenches shall start from the owner part upwards (from the gully exit) using excavator with buckets not more than 0.4m, or using other similar equipment. Excavation length for draining material must not exceed the distance between manholes. A part of soil will be left for drainage screen; the surplus of material will be transported for stockpiling. Excavation and backfilling shall be carried out in accordance with the requirements of Chapter 203

A subbase layer of coarse sand shall be placed on the bottom of the trench,  $h=0.10\text{m}$  giving a shape of a concave curve for the pipes coupled with Drainage Geocomposite Type 3 according to Chapter 902. The profile of the trench bottom shall be checked with a template, the bottom gradient - with a leveller.

The coarse sand shall be supplied to the site with the trucks and be stockpiled along the trench or slopes. The sand, as necessary, shall be pushed into the trench with the excavator bucket, shall be spread with shovels on the bottom in 10cm layer and shall be compacted by an electrical compactor. Similarly with the bottom of the manhole.

The flexible subdrainage pipes and Drainage Geocomposite shall be supplied to the site with the trucks and be stockpiled along the trench.

All the materials shall be checked for defects, no faulty materials shall be used.

The flexible subdrainage pipes and Drainage Geocomposite shall be coupled, wrapping one of the Geocomposite strips around the flexible subdrainage pipes and pinning it to the pipes.

A galvanized 2-3mm steel wire shall be inserted into the flexible pipes to be used for pipe cleaning.

The coupled pipes with the Geocomposite shall be dropped into the trench, being manually placed on the prior compacted bottom and checked for design gradient.

Coarse sand shall be used for filling the trench. Sand fill shall have  $2/3H$  (1.05m) of the trench depth. The sand surface shall be manually levelled with shovels. Clay soil shall be placed on top of draining fill layer, up to design levels, forming a screen (a lock) not less than 0.5m.

Manholes shall be located wherever the drain changes direction or gradient. On straight sectors of steady gradient, manholes shall be located at each 50 meters.

In places for manholes, trenches shall be made wider and deeper by 0.5m. Trench shoring shall be used to protect the slopes against sloughing.

The bedding prepared in advance for foundation shall consist of crushed stone compacted into the soil, on top of which will be strictly horizontally placed the foundation slab. On top of the slab a layer of cement mortar shall be placed for the precast ring units, which will be installed on top of mortar by a crane, checking its position to the level and line. Holes for the drainage pipes are to be made beforehand in the lower part of the precast ring unit for manhole. After pipe installation the joints between the manhole wall sections and the pipes are to be sealed using cement mortar. As the manhole is constructed, a mortar-cement layer is placed on the upper face of last ring fixed and the next ring is then set in place using a crane. The squeezed mortar from the joints shall be removed and the joints shall be sealed. The gaps around the manhole

shall be filled with draining material and then with soil, being compacted in lifts not more than 30cm.

The completed manhole barrel will be tightly closed with a precast fixed cover having an opening not less than 500mm x 500mm which itself shall be closed with an approved removable cover. The opening shall be located to one side of the fixed cover giving easy access inside the manhole barrel. Step irons at intervals of 200mm alternating from side to side running down inside the manhole from the removable cover permitting easy descent to the bottom of the manhole.

From the exit gully of subdrainage pipe the water shall discharge into a silt collection basin of reinforced concrete having the design sizes of 0.50 x 3.50 meters and a 0.80m depth from the pipe invert. Waters from collecting basin shall overflow via a spillway at the same level as the pipe invert into the closest open side ditch, culvert or watercourse.

#### **905.04. Acceptance of Works**

The works shall be accepted based on the provisions of Chapter 002 provided they are compliant with all the requirements of this specification, are approved by the Engineer and satisfy the following tolerances.

The deviations will be no more than:

- longitudinal declivity +0,0005
- transverse dimensions +5cm;
- bottom trench level +1cm;
- thickness of the draining layers +10%.

#### **Measurement**

Execution of trench and subdrainage, including all excavation and backfilling works, pipe installations, gravel and filter materials, impervious membrane shall be paid per linear meter. The measurement shall be overall and no deduction shall be made for manholes

Execution of manholes, including all excavation works, manhole materials, foundation, backfilling and accessories shall be paid per linear meter of constructed manhole measured vertically from the top of the base to the underside of the cover slab.

Execution of silt traps including any required connecting subdrains shall be measured by number of traps constructed

#### **Payment**

The works measured as indicated above and confirmed by the Engineer will be paid at the rates provided in the contract against those items that are shown in the bid schedule. The payment under these items shall be the whole of the payment due for the completion of all the works indicated in this chapter.

Payment will be made under some or all of the items below:

<b>No.</b>	<b>Item</b>	<b>Unit of Measure</b>
90501	Construction of the filter drain	Linear meter

90502	Construction of the silt trap	Number
90503	Construction of the manhole	Linear meter
90504	Manhole cover of cast iron	Number

***CHAPTER 906. NOT USED***