



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

and

European Bank for Reconstruction and Development

ROAD SECTOR PROGRAM

**Rehabilitation of M3 Chisinau-Giurgiulesti Road km
151+200-km 171+290 and km 179+650-km 190+750**

TENDER DOCUMENTS:

**PART 2 – REQUIREMENTS
-SPECIFICATIONS-**

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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.

Failure to itemize every allowable exception or condition does not mean that the governing provisions will be enforced equally under all conditions or on all parts of the work; the Engineer will decide all discretionary matters as they arise.

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.

For payment, the design dimensions will be used preferably to calculate the quantity for all items of work. The Engineer will generally limit the designated quantities to those items whose dimensions are specified and controlled by field checks during or after construction. The Engineer's intent is to avoid unnecessary expense in measuring dimensions where the original design dimensions are still valid.

The Engineer will determine the quantities of those items that do not have a designation in the drawings by using the methods of measurement indicated in the Contract, unless otherwise agreed to in writing.

The Engineer will use design dimensions to the extent applicable to complete work and will use field dimensions only when specifically indicated in the Contract or when necessary to accurately dimension the completed work.

The Engineer may adjust quantities for portions of the work or for the entire Project. The Engineer will not adjust quantities when a difference results from the use of commonly accepted dimensional approximations.

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. 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 neat lines shown on the plans or to approved lines that have 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 monthly in proportion to the value of work completed during the month compared to the total value of work under the contract. The value of General Items, Day works and Provisional sums will not be considered in these calculations.

Payment for 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 removal of required signs or other safety fixtures, or not replacing the damaged safety fixtures with the new ones during the construction, proportionate payment shall be deducted from the contractor's statement. . 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

No.	Item	Unit of Measure
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:

Grade	60 – 90	90 – 130
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 1Pa.s = 1000 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

Required characteristic	standardised test method	Requirements (nominal value +/- tolerance)
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 Generic 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 Generic 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.

Independent monitoring of the environment will be taking place throughout the period of the Works. The Monitors will report any breaches of environmental requirements to the Employer and the Engineer; the staff of the Engineer will also monitor for compliance with environmental requirements on a day to day basis. Failure to comply with any environmental requirements will result in a penalty of 1000 EURO/ day calculated from the day the Contractor was instructed to remedy the noncompliance, and in a withholding of an additional EURO 100,000 from the subsequent interim payment certificates until the Contractor complies with the environmental requirement and rectifies any resultant environmental damage.

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 Lump Sum for compliance with the Environmental Management Plan Requirements will be paid monthly in proportion to the value of work completed during the month compared to the total value of work under the contract. The value of General Items, Dayworks and Provisional sums will not be considered in these calculations. In the event of persistently inadequate measures under this item during construction, the Engineer may reduce the monthly amount payable accordingly. Any such amounts deducted shall not later be recoverable.

No.	Item	Unit of Measure
01601	Compliance with Environmental Management Plan Requirements	Lump Sum

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	NCM D.03.01-2006 MCH 3.03-01-95	1520mm Gauge Railways
		Cale Ferate cu Ecartamentul 1520mm
7	CP D.03.01-2009 CTH LJ-01-95	1520mm Gauge Railways
		Cale Ferate cu Ecartamentul 1520mm
8	CP.D.03.02-2009 CP 32.104-98	Design of Embankments for 1520mm Gauge Railways
		Proiectarea Terasamentului Cailor Ferate cu Ecartamentul 1520mm
9	SNIIP 2.02.02 – 85*	Foundations of water retaining structures.
		Fundatii hidrotehnice
10	SNIIP 2.02.03 - 85	Pile foundation
		Fundatii pe piloti
11	SNIIP 2.03.11 - 85 * (CP E.04.03-2005)	Protection of structures against corrosion.
		Protectia constructiilor impotriva coroziunii
12	SNIIP 2.05.02 - 85*	Highways (Design standards)
		Drumuri (Norme de proiectare)
13	SNIIP 2.05.03 - 84*	Bridges and culverts (Design standards)
		Poduri si podete (Norme de proiectare)
14	SNIIP 3.01.01-85*	Organization of building production
		Organizarea productiei de constructie
15	SNIP 3.01.03-84	Survey and setting out works in construction
		Lucrari topogeodezice in constructie
16	SNIP 3.01.04-87	Acceptance of completed Works. General provisions.
		Receptia lucrarilor finalizate. Prevederi generale. Hotararea nr.285 In vigoare.
17	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
18	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"
19	SNiP 3.04.03 - 85	Protection of erected constructions and structures against corrosion Protectia edificarilor si constructiilor impotriva coroziunii. C PE.04,03 - 2005
20	SNiP 3.05.06-85	Electrical devices Dispozitive electrice
21	SNiP 3.06.03 - 85	Highways (Construction and acceptance of works. Regulations). Drumuri auto(Prescriptii la efectuarea lucrarilor si receptia lor)
22	SNiP 3.06.04 - 91	Bridges and culverts (Construction and acceptance of works. Regulations) Poduri si podete (Prescriptii la efectuarea lucrarilor si receptia lor)
23	SNiP 3.06.07-86	Bridges and culverts. Rules for Inspection and Testing Poduri si podete. Regulament pentru inspectari si incercari
24	SNiP II-7-81*(for cl.3.35 to 3.51 of SNiP is applied NCM F.03.02-2005)	Construction in Seismic Regions Constructii in zone seismice
25	SNiP III-4-80*	Construction safety regulation Tehnica securitatii in constructii
26	SNiP III -18 - 75	Metal structures Constructii metalice
27	PUE	Electrical code (7 edition) Normativ Electric (7 editie)
28	PTE	The technical operation of electrical installations Operatiuni tehnice al instalarii electrice
29	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
30	VSN 24 - 88	Repair and maintenance of highways. Technical standards. Normele tehnice pentru reparatia si intretinerea drumurilor auto.
31	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.
32	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
33	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
34	VSN 38 - 90	Road pavement works on top of uneven surfaces. Technical standards. Normele tehnice pentru executarea imbracamintilor rutiere cu suprafata rugoasa
35	VSN 81 - 80	Manufacturing and Construction of RC and Concrete Culverts. Instructions Instructiuni pentru fabricarea si constructia podetelor din beton si beton armat
36	VSN 86 - 83	Designing and Mounting of Rubber Bearing Pads. Instructions Instructiune pentru proiectarea si asezarea aparatelor de reazem din polimeri la poduri
37	VSN 139-80	Cement Concrete Pavements. Instructions Constructia imbracamintei din beton cu ciment. Instructii
38	ODN 218.046-01	Designing of Flexible Road Pavement. Instruction. Proiectarea imbracamintei rutiere nerigide. Instructii
39	ENiR, pc E 2 - 1 - 45	Mechanical and Manual Earthworks. Lucrari de terasamente mecanizate si manuale
40	ENiR, pc E 18 - 24	Revegetation Lucrari de inverzire
41	GOST 9.032 - 74*	Lacquer and Paint Coating. Groups, Technical Requirements. Acoperirea cu lac si vopsea. Tipuri, conditii tehnice si marcari.
42	GOST 82-70*	Universal hot-rolled wide strip steel Laminarea universala a fisiilor late de otel la temperaturi inalte
43	GOST 310.1 - 76*	Cements. Test Methods. General provisins. Cimenturi. Metode de testare. Prevederi Generale
44	GOST 310.2 - 76*	Cements. Method for Coarseness Determination. Cimenturi. Metode de determinare a finetei de macinare
45	GOST 310.3 - 76*	Cements. Methods for Determination of Standard Consistency, of setting time and of Sound Cement. Cimenturi. Metode de determinare a consistentei normale, termenilor de priza si schimbarii uniforme a volumului
46	GOST 310.4 - 81	Cements. Methods for Determination of bending and compression strength. Cimenturi. Metode de determinare a rezistentei la incovoiere si compresiune
47	GOST 380-94,	Ordinary carbon steel. Grades.

	GOST 380-2005	Otel-carbon obisnuit. Marca de otel
48	GOST 931 - 90	Brass sheets and strips. Technical conditions.
		Table si fasii din cupru. Conditii tehnice
49	GOST 4245 - 72	Drinking water. Methods for determination of chloride content
		Apa potabila. Metode de determinare a continutului de cloruri
50	GOST 4389 - 72	Drinking water. Methods for determination of sulphate content
		Apa potabila. Metode de determinare a continutului de sulfati
51	GOST 5336-80*	Single bar steel grids. Technical Conditions.
		Plase de otel ordinare.
52	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.
53	GOST 5802 - 86	Mortars. Test methods.
		Mortare de constructii. Metode de testare
54	GOST 6665-91	Concrete and reinforced concrete kerbs. Specifications.
		Elemente prefabricate din beton si beton armat pentru borduri
55	GOST 6727-80*	Hard draw low-carbon steel wire for reinforced concrete. Technical requirements
		Sirma din otel cu continut jos de carbon intinsa la temperaturi joase. Conditii tehnice
56	GOST 6713-91	Low-alloyed structural rolled steel for bridge construction. Specifications.
		Laminarea otelului cu continut jos de carbon pentru constructia podurilor
57	GOST 7473 - 94	Ready-mixed concrete. Technical Conditions.
		Amestecuri de beton. Conditii tehnice
58	GOST 8267 – 93*	Crushed dense aggregates and gravel for construction. Technical Conditions.
		Piatra concasata din roca densa de munte pentru constructie. Conditii tehnice.
59	GOST 8269 - 87*	Natural Crushed Stone, Gravel for Construction. Test Methods.
		Piatra naturala sparta, pietris pentru lucrari in constructie. Metode de testare
60	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.
61	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
62	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

63	GOST 8735 – 88*	Sand for construction. Testing methods.
		Nisip pentru lucrari in constructie. Metode de testare
64	GOST 8736 -93*	Sand for construction. Technical Conditions.
		Nisip pentru lucrari in constructie. Conditii tehnice
65	GOST 9812-74*	Petroleum bitumen. Technical Conditions.
		Bitumul petrolier de izolare. Conditii tehnice
66	GOST 9825 -73*	Lacquer-painting materials. Terms, definitions and designation.
		Materialele din vopsea cu lac.Termenii, definitii, marcare.
67	GOST 10060.0 - 95	Concrete types. Frost Resistance Test Method.
		Tipiri de beton. Metode de determinare a rezistentei la inghet-dezghet
68	GOST 10178 – 85*	Portland cement and Portland blast furnace slag cement. Technical Conditions.
		Ciment portland si ciment portland cu adaos de zgura (Conditii tehnice)
69	GOST 10180 - 90	Concrete Types. Test Methods for strength of specimens.
		Tipuri de beton. Metode de determinare a rezistentei probelor de control
70	GOST 10181-2000	Concrete mixtures. Test Methods.
		Amestecuri de beton. Metodele de testare
71	GOST 10704-91	Longitudinal (electric) welded steel pipes (tubes). Assortment.
		Tevi de otel electric sudate longitudinal. Sortiment
72	GOST 10807-78* (Modificarea nr .3) Replaced by SM GOST R 52290:2009	Road signs. General technical requirements
		Indicatoare rutiere. Cerinte tehnice generale
73	GOST 11501 - 78*	Petroleum Bitumen. Penetration Test Method.
		Bitumul petrolier. Metode de determinare a penetratiei
74	GOST 11503 - 74*	Petroleum Bitumen. Viscosity Test Method.
		Bitumul petrolier. Metode de determinare a viscozitatii
75	GOST 11955-82*	Cutback Road bitumen. Technical Conditions
		Bitumul lichid pentru drumuri. Conditii tehnice
76	GOST 12071 - 2000	Soils. Sampling, handling and sample storage.
		Soluri. Selectarea, ambalajul, transportarea si pastrarea probelor.
77	GOST 12248 - 96	Soils. Laboratory methods for strength and shear strength.
		Soluri. Metode de determinare a rezistentei si rezistentei la deformare
78	SR EN 1463-1	Products for road marking. Road Studs Produse pentru marcare rutiera. Butoane reflectorizante
79	GOST 12536 - 79	Soils. Laboratory Grading Analysis Method.
		Soluri. Metode de determinare a compozitiei granulometrice in laborator
80	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
81	GOST 12730.5-84*	Concrete Types. Impermeability to water Test Methods. Tipuri de beton. Metode de determinare a impermeabilitatii
82	GOST 13508 - 74*	Road Marking Marcaj rutier
83	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
84	GOST 15836 -79	Bituminous rubber insulating mastic. Technical conditions Mastic bituminos cu cauciuc izolant. Conditii tehnice
85	GOST 16557 - 78	Filler for asphaltic-concrete mixtures. Technical requirements Filer pentru beton asphaltic (Conditii tehnice)
86	GOST 18105 - 86*	Concrete Types. Strength Test Methods. Tipuri de beton. Reguli de control a rezistentei betonului
87	GOST 18164 -72	Drinking water. Test Method for Solid Residue Content. Apa potabila. Metoda de determinare a continutului de rezidii solide
88	GOST 18599-2001*	Polythene pressure pipes. Specifications Tevi de presiune din polietilen. Conditii tehnice.
89	GOST 18659 - 81	Road Bitumen Emulsions. Technical requirements. Emulsii bituminoase pentru drumuri. Conditii tehnice
90	GOST 20522 - 96	Soils. Statistical processing method of test results. Soluri. Metoda statica de prelucrare a rezultatelor testarilor
91	GOST 22245 -90*	Viscous Road Petroleum Bitumen. Specifications Bitumul viscos pentru drumuri. Conditii tehnice
92	GOST 22733 - 2002	Soils. Laboratory method for maximum density Soluri. Metode de laborator de determinare a densitatii maxime
93	GOST 23279 - 85	Welded reinforcement grids for precast reinforced concrete structures and units. General Technical Conditions. Plase sudate metalice pentru construcii si articole din beton armat. Conditii generale tehnice
94	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.
95	SM STB 1033 -2008	Asphalt concrete mixtures for road and aerodromes and asphaltic concrete. Specifications. Amestecuri de beton asphaltic pentru drumuri si aerodromuri si beton asphaltic. Conditii tehnice
96	SM STB 1062-2008	Oil bitumens for road pavement wearing course. Specifications. Bitumiri de petrol pentru stratul superior al imbracamintei rutiere. Conditii tehnice.

97	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.
98	SM STB 1220 - 2008	Modified road bitumens. Specifications.
		Bitumiri rutiere modificate. Conditii tehnice.
99	SM STB 1311 - 2008	Cubical crushed stone from dense mountain breeds. Specifications.
		Piatra sparta de forma cubica din roci de munti tari. Conditii tehnice.
100	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
101	GOST 23732 - 79	Water for concrete and mortar. Specifications.
		Apa pentru beton si mortar. Conditii tehnice
102	GOST 24143 - 80	Soils. Laboratory methods for swelling and subsidence
		Soluri. Metode de determinare a caracteristicilor la umflare si tasare
103	GOST 25192 – 82*	Classification of Concrete and general technical requirements.
		Clasificarea betonului. Conditii tehnice generale.
104	GOST 25328 - 82	Building mortar cement. Specifications.
		Ciment pentru mortare de constructii. Conditii tehnice
105	GOST 25584 – 90*	Soils. Laboratory method for permeability coefficient.
		Soluri. Metode de determinare a coeficientului de filtratie in laborator
106	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
107	GOST 26633 – 91*	Heavy-weight and sand concretes. Specifications
		Beton greu cu granulatie fina (Conditii tehnice)
108	GOST 26804 -86	Metal road safety barriers. Specifications
		Parapeti metalici de siguranta. Conditii tehnice.
109	GOST 28013 – 98*	Mortar Types. General Technical Conditions.
		Mortare de constructie. Conditii tehnice generale
110	GOST 30055-93*	Ropes of polymeric materials and combined ropes. Specifications
		Odgoane din materiale polimerice si odgoane combinate. Conditii tehnice
111	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
112	SM GOST R 52289:2009	Traffic control equipment: road signs, marking, traffic lights, parapets and guiding devices. Application.

	SE REPETA 89	Mijloace tehnice de dirijare a circulației rutiere: indicatoare rutiere, marcajul, semafoare, parapete, dispozitive de orientare. Reguli de aplicare.
113	GOST 9238-83	Construction and rolling stock clearance diagrams for the railways of 1521 (1524) mm gauge Gabarit de apropiere a construcțiilor și a garniturilor de tren pentru caile ferate cu calea de 1521(1524)
114	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
115	GOST 26804-86	Road metallic barriers. Technical requirements Parapet metalic pentru drumuri de tip bariera. Condiții tehnice
116	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
117	GOST 25458-82	Wooden (timber) posts for road signs. Specifications Stâlpi de lemn pentru montarea indicatoarelor rutiere. Specificații tehnice
118	GOST 25459-82	R/C posts for road signs. Specifications. Marcaje rutiere. Tipuri și parametri de bază. Cerințe tehnice generale pe teritoriul Moldovei
119	SM GOST R 52575:2001 GOST R 52766-2007	Materials for Road Marking. Furniture Elements, General requirements Materiale pentru marcajul rutier Accesorii. Cerințe generale
120	GOST 6665-91	Concrete and R/C kerbs. Specifications. Piloni din beton armat pentru montarea indicatoarelor rutiere. Specificații tehnice
121	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
122	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
123	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
124	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

125	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
126	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
127	GOST 20444-85	Noise. Traffic flows. Measurement methods of noise characteristics
		Zgomotul. Fluxul de transport. Metode de măsurare a caracteristicilor de zgomot
128	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
129	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
130	SP MD 93-16-001-95 STANDARD PROFESIONAL	Roadways. Kilometer posts Lucrari de drumuri. Indicatoare kilometrice
131	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.
132	GOST 103-2006	Hot-rolled steel strips. Dimensions
		Platbanda din otel laminat la cald. Sortiment
133	GOST 2591-88 Replaced by GOST 2591-2006	Square hot-rolled Steel Bars Dimensions
		Bare din otel cu sectiune patrata laminate la cald. Sortiment
134	GOST 5264-80*	Manual welding. Welding joints. Main types, design elements and dimensions
		Sudura de mana. Conexiuni sudate. Tipuri de baza, elemente constructive
135	GOST 5915-70*	Hexagon nuts, product grade B. Construction and dimensions
		Piulite hexagonale cu clasa de precizie B. Structura si dimensionarea
136	GOST 8239-89	Steel hot-rolled I-beams
		Grinzi dublu T din otel laminat la cald
137	GOST 8509-93	Hot-rolled steel equal-leg angles. Dimensions
		Corniere din otel cu aripi egale laminate la cald. Sortiment
138	GOST 8639-82*	Square steel pipes. Assortment
		Tevi din otel cu sectiune patrata. Sortiment
139	GOST 8734-75*	Seamless cold-deformed steel pipes. Range of sizes
		Tevi din otel deformabile la rece. Sortiment

140	GOST 9128-2009 SMSTB 1033:2008	Asphaltic concrete Mixtures for roads and aerodromes and asphaltic concrete. Specifications
		Amestecuri din asfalt si beton asphaltic pentru drumuri si aerodromuri. Conditii tehnice
141	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 selectric a otelurilor de constructie si rezistente la temperatura. Tipuri
142	GOST 10587-93	Uncured epoxy resins. Specifications
		Rasini epoxidice neintarite
143	GOST 10923-93*	Ruberoid. Technical requirements
		Ruberoid. Conditii tehnice
144	GOST 11371-78*	Washers. Technical requirements
		Saibe. Conditii tehnice
145	GOST 28012-89	Demountable travelling stage. Specifications
		Schele mobile si demontabile. Conditii tehnice
146	GOST 28570-90	Concretes. Strength evaluation methods by means of sampling
		Betoane. Metodele de determinare a rezistentei betonului prin testarea carotelor prelevate din constructii
147	GOST 30547-97	Roofing and hydraulic insulating materials in rolls General specifications
		Materiale de acoperis si hidroizolare in rulouri. Conditii tehnice generale
148	GOST 8240-97	Hot-rolled steel channels. Assortment
		Otel cu profil U laminat la cald. Sortiment
149	GOST 6713-91	Low-alloyed structural rolled stock for bridge building. Specifications
		Laminat de constructii cu aliere scazuta pentru constructii de poduri. Conditii tehnice
150	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
151	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
152	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.
153	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
154	TU 1-51-75	Waterproofing layer
		Strat izolant

155	TU 400-1/55-16-76	Waterproofing layer
		Strat izolant
156	TU 2539-008-00149334-2003	Neoprene bearings
		Ghid de proiectare si instalare a aparatelor de raezem din neopr n pentru poduri
157	TU 5210-001-25432924-2008	Road metallic barriers. Specifications
		Parapet metalic pentru drumuri de tip bariera. Conditii tehnice
158	TU 14-4-1731-2007	Fired pin for assembly
		Dibluri-cuie pentru montare
159	Standard design 503.09-7.84	Drainage structures for roads
		Constructii pentru evacuarea apelor de pe drumuri auto
160	Standard design series 3.500.1-1.93	R/C piles of rectangular shape and solid sectiuon for bridge piers
		Piloti din beton armat dintr-o bucata cu sectiune plina dreptunghiulara pentru pile de poduri
161	Standard design series 3.501-91	Precast, pretenssioned R/C beams of a length between 16.6 and 27.6 m for railway underpass
		Grinzi prefabricate din beton armat pretensionat cu lungimea de la 16,5 pana la 27,6m pentru podur de cale ferata
162	Standard design series 3.501-108	Precast R/C beams of a length between 2.95 and 16.5 for railway underpass
		Grinzi prefabricate din beton armrt cu lungimea de la 2,95 pana la 16,5m pentru podur de cale ferata
163	Standard design series 3.501-129	Bearings for R/C superstructures of a length between 4.0 and 34.2m for railway underpass
		Aparate de reazem pentru suprastructuri din beton armat cu lungimea de la 4,0 pana la 34,2m pentru poduri de cale ferata
164	Standard design series 3.501-146	Precast R/C beams of a length between 2.95 and 16.5 for railway underpass. Edition 3. Mettallic elements, As-built drawings
		Grinzi prefabricate din beton armrt cu lungimea de la 2,95 pana la 16,5m pentru podur de cale ferata. Editia 3. Articole metalice. Desene de executie
165	Standard design series 3.501-150	Unified piers for railway underpass using precast elements. Edition 0-2. Column piers. Materials for design
		Pile unificate pentru poduri de cale ferata cu utilizarea elementelor prefabricate. Editia 0-2. Pile cu stalpi. Materiale pentru proiectare
166	Standard design Series 3.501.1-156	Slope consolidation with concrete
		Protejarea albiilor si taluzelor la poduri mici si mijlocii, si la podete
167	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
168	Standard design Series 3.503-41	Bridge and overpasses approaches
		Racordarea podurilor si pasajelor de sosea cu terasamentul rampei de acces
169	Standard Design	Reinforced concrete precast elements for drainage from roads

	Series 3.503.1-66	Elemente prefabricate din beton armat pentru sisteme de evacuare a apei de pe drumurile auto
170	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
171	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
172	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
173	Standard design Series 3.503.1-96	Approaches to the bridges and overpass
		Racordarea podurilor si pasajelor de sosea cu terasamentul
174	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.
		Hidroizolatiea 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
175	Standard design Series 3.503.1-96	Approaches to the bridges and overpass
		Racordarea podurilor si pasajelor de sosea cu terasamentul
176	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.
		Hidroizolatiea 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:

ITEM	CONTRACT OFFICE	LABORATORY OFFICE
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

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.

101.04. Works Acceptance

Measurements

- The surveying and setting out works will be measured in kilometres or parts of a kilometre.
- The preparation of construction and record drawings shall be measured in kilometers or parts of a kilometer.

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 Construction Drawings prepared and accepted by the Engineer shall be paid according to the unit price per kilometer provided in the Contract.

70% of the cost shall be payable on acceptance by the Engineer of the Construction Drawings

30% of the cost shall be payable on acceptance by the Engineer of the Record Drawings

The payment shall be made under the following item:

No.	Item	Unit of Measure
10101	Surveying and setting out works	Kilometre
10102	Preparation of Construction Drawings (bridges)	Kilometre
10103	Preparation of Record Drawings	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, 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 SNiP2.05.02-85.

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 hectare (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 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:

No.	Item	Unit of Measure
10301	Removal of concrete kerb and dispose	Linear Metre
10302	Remove cable type Guard Rail and deliver to Employer	Linear Metre
10303	Remove steel w-beam type guard rail and deliver to Employer	Linear Metre
10304	Remove marker posts and dispose	Number
10305	Traffic signs removal and deliver to Employer	Number
10306	Removal of the old road pavement under pavement	Square 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.

No.	Item	Unit of Measure
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 92 % MDD. The fill material in the layer 300 mm below formation (subgrade) in embankments shall be compacted to 95 % 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 3:1

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 3:1

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 92% 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 22733-77 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 95% 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 95 % 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 92 % 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:

No.	Item	Unit of Measure
20101	Load, place and compact to 95%MDD in road embankment, incl haulage and benching of embankment slope for widen the existing road embankment (material from cut to fill).	Cubic Metre
20101A	Provide suitable material for fill in embankment and access roads adjustments, incl haulage and compaction to 95%MDD	Cubic Metre
20102	Excavate material in road area (cut to fill), incl temporary storage at site for re-use.	Cubic Metre
20102A	Excavate after removal of bituminous surface all type of material in road area and access roads adjustments to any depth as directed by the Engineer (cut to spoil) and dispose in contractors dump site.	Cubic Metre
20102B	Excavate material in road area unsuitable material to any depth as directed by the Engineer and dispose in contractors dump site.	Cubic Metre
20103	Select Fill to Shoulders (Shoulder fill)	Cubic Metre
20104	Finishing and trimming of cut and fill slopes	Square Metre
20104.1	Finishing and trimming of cut and fill slopes (manual)	Square Metre
20105	Shaping of the subgrade layer (formation level)	Square Metre
20105.1	Shaping of the subgrade layer (formation level) (manual)	Square Metre
20106	Shape and compact subgrade (Shoulders)	Square Metre
20107	Placement of geotextile and filter separating membran	Square Metre

20108	Regrading of shoulders	Square Metre
20117-01	Protection of slopes the geotextile	Square Metre
20117-02	Protection of slopes with and granular fill composing of crushed stone (#10/40 mm)) with layer thickness of 1000 mm	Cubic 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 95% 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:

No.	Item	Unit of Measure
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, oversize 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 22733-77.

Backfill materials will be compacted for each course, until the homogenous density will be no less than 95% out of the maximum density, according to SM GOST 22733-77.

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 22733-77.

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:
95 % 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

No.	Item	Unit of Measure
20401	Loading of stockpiled topsoil, spread on embankment slopes of min 150 mm thickness, light compaction	Cubic Metre
20402	Provide top soil, spread on embankment slopes and road sides of min 150 mm thickness, light compaction	Cubic Metre
20403	Provide grassing to embankment and road sides, incl maintenance up to end of defects liability period	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.

No.	Item	Unit of Measure
20501	Planting of trees	Number
20502	Planting of shrubs	Number

3. PAVEMENT

CHAPTER 301. Coldin 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 ± 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 m² 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
30103	Cold recycling of the asphalt concrete pavement at a depth of 100 - 200 mm. Mixing in of 50% new aggregates and stabilization with 4 % cement. Regulation to required transverse and longitudinal profile. Compaction. Total layer thickness 50 - 300 mm	Cubic Meter
30105	Cement	included
30107	Additives	included

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	Asphalt Concrete Pavement Milling to any depth	Cubic Metre
30202	Asphalt Concrete Pavement Milling at a depth of 2 cm	Square Metre
30203	Asphalt Concrete Pavement Milling at a depth of 2-4 cm	Square Metre
30204	Asphalt Concrete Pavement Milling at a depth of 4-6 cm	Square Metre
30205	Asphalt Concrete Pavement Milling at a depth of 6-8 cm	Square Metre
30206	Asphalt Concrete Pavement Milling at a depth of 8-10 cm	Square Metre
30207	Asphalt Concrete Pavement Milling at a depth of 10-12 cm	Square Metre
30208	Asphalt Concrete Pavement Milling at a depth of 12-14 cm	Square Metre

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 95% MDD (AASHTO T180) or to a minimum of 100% of the density determined according to SM GOST 22733-77. 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:

No.	Item	Unit of Measure
30301	Capping layer	Cubic Metre
30302	Subbase courses of limestone	Square Metre
30303	Base course of crushed stone	Square 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 0 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/m². 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/m². 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:

No.	Item	Unit of Measure
30401	Prime-coat using cutback bitumen, 0.8 to 1.0 L/m ²	Litre
30402	Tack coat using cutback bitumen or bitumen emulsion, 0.25 to 0.4 L/m ²	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 particlesdust 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 startup 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 m² 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.

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 98% 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 306.03-85.

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:

No.	Item	Unit of Measure
30501	Wearing course of stone mastic asphalt concrete Thickness 40 mm	Square Metre
30502	Binder course of asphalt concrete M1 - Thickness 40 mm	Square Metre
30503	Binder course of asphalt concrete M1 - Thickness 60 mm	Square Metre
30504	Wearing course of asphalt concrete from asphalt concrete Type V M III Thickness 50 mm	Square Metre
30504A	Wearing course of asphalt concrete from asphalt concrete Type V M III Thickness 40 mm	Square Metre
30504B	Wearing course of asphalt concrete from asphalt concrete Type V M III Thickness 60 mm	Square Metre
30505	Binder course of asphalt concrete M II Thickness 80 mm	Square Metre
30506	Wearing course of asphalt concrete Type B M III Thickness 40 mm	Square Metre
30507	Geocomposit	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:

No.	Item	Unit of Measure
30601	Excavation and disposal or reuse of existing shoulder material (Shoulder material to fill)	Cubic Metre
30602	Shoulder surfacing material	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 tonnes.

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:

No.	Item	Unit of Measure
30701	Asphalt Pavement, type V M III, Thickness 30 mm	tonnes
30702	Base course of concrete B20, Thickness 200mm	Square meter
30703	Base course of sand mixed with cement, Thickness 60mm	Square meter
30704	Paving with bolder granite stone of red color	Square meter

CHAPTER 308. CEMENT-STABILIZED BASE WORKS**308.01. Introduction**

Cement-stabilized base course consists of soil and Portland Cement uniformly mixed, moistened, compacted, finished and cured in accordance with these Specifications, and it conforms to lines, grades, thicknesses and typical cross-section shown or as directed by the Engineer, and shall be according to VSN 16-95.

308.02. Materials

Portland cement and water according to Specifications, curing seal shall be emulsified asphalt and the granular material shall not contain gravel or stone retained on a 50mm sieve or more than 45 percent retained on a 5.0mm sieve.

308.03. Equipment and preparations

Portland cement-stabilized base shall be constructed by any machine, combination of machines or equipment that will produce results meeting the requirements for soil pulverization, cement application, mixing, water application, incorporation of materials, compaction, finishing and curing as controlled by these Specifications. All equipment necessary for the proper construction of the base course shall be on the project and in satisfactory condition before construction begins.

Before other construction operations are begun, the areas to be paved are graded and shaped as required to construct the base course in conformance with grades, lines and typical crosssection shown on the plans. Unsuitable or excess material shall be removed, disposed of and leveled at a designated dump area. The subgrade shall be firm and able to support, without displacement, the construction equipment and

compaction hereinafter specified. Soft or yielding subgrade shall be made stable before construction proceeds.

308.04. Central Plant-Mix Operation

The soil material, cement and water are mixed at a central mixing plant of the pugmill or rotary drum type using a batch or continuous feed. If a batch feed is used, the materials are proportioned by weight, and if a continuous feed is used, the materials are proportioned by volume. If the Contractor employs a continuous type mixer and feed, the soil shall be drawn from storage bins or areas through adjustable calibrated gates or fixed gate feeder with adjustable speed control. The mixer shall be equipped with metering devices of an approved type which introduce the cement and water into the mixer in desired proportions. The metering devices and soil feeder shall be interlocked and so synchronized as to maintain a constant ratio between soil, cement and water. Where the Engineer deems it necessary for the accurate control of cement feed, the Contractor equips the cement storage hoppers with a compressed air system to eliminate the possibility of arching of the cement. The plant shall be equipped with facilities satisfactory to the Engineer for calibrating gate opening or rate of feed, by weighing check samples.

The weight of charge in a batch mixer or the rate of feed to a continuous type mixer shall not exceed that which permits complete mixing of all material. Dead areas in the mixer, in which material does not move or is not sufficiently agitated, are corrected either by reduction in volume of material or by other adjustments. Mixing of the materials shall be continued until the cement and water are evenly distributed through the mass and a uniform mixture of unchanging appearance is obtained. In no case shall the period of mixing be less than thirty (30) seconds from the time all materials are in the mixer. Sufficient mixing capacity shall be provided to produce a minimum of 150t of cement stabilized mixture per hour. The Engineer reserves the right to order the use of any proportioning or mixing equipment discontinued, where in the opinion of the Engineer it fails to produce a satisfactory mixture. Immediately prior to spreading soil-cement base course material, the surface of the prepared subgrade shall be moistened and kept moist until covered by the mixture. Materials are transported from the central mixing plant to the street by means of suitable vehicles, equipped with protective covers, and deposited by employing approved spreading equipment. Dumping in piles on the subgrade shall not be permitted. The mixture shall be spread in one layer of uniform density and of such thickness that after compacting, the finished soil-cement base conforms to the required grade and cross-section. The spreading progresses continuously without breaks and shall be organized so that not more than thirty (30) minutes elapses between the time of placing the material in adjacent lanes at any location.

After a part width section is completed, the longitudinal joint against which additional material is to be placed shall be trimmed in a neat line parallel to the curb and with a vertical edge. Material cut away from the edge shall be spread uniformly over the adjacent subgrade and compacted or otherwise disposed of as directed by the Engineer. Transverse construction joints are treated in a similar manner.

308.05. Compaction

The mixture shall be compacted within two (2) hours after the addition of water. Any soil and cement mixture which is not compacted and finished shall not remain undisturbed for more than thirty (30) minutes. At the start of compaction, moisture in the mixture shall be within two (2) percentage points of the specified optimum moisture content.

Prior to the beginning of compaction, the mixture shall be in a loose condition for its full

depth. Compaction shall be carried out on the loose material until it has attained a uniform density of one hundred (100) percent of the Maximum Design Density as determined by a moisture density test. Compaction may be obtained by steel wheel, grid or pneumatic rollers, vibratory or sheepsfoot packers or any other means approved by the Engineer. Following initial compaction, the mixture shall be shaped to the required grade and cross-section. Where necessary the surface shall then be scratched to remove compaction planes which may have developed during compaction. Final compaction to the specified density shall be done with steel wheel or pneumatic rollers, or vibratory packers. If the specified density is not attained, the Contractor, at his own expense, shall complete one of the following operations as instructed by the Engineer.

- Reprocess the same soil-cement material within twenty-four (24) hours of the original application of cement and water, with the addition of seventy-five (75) percent of the original cement content.
- Reprocess the same soil-cement material after the elapse of twenty-four (24) hours with the addition of one hundred (100) percent of the original cement content.
- Remove the soil-cement base and replace it with new approved material processed in accordance with these Specifications.
- Complete the surfacing operation in two (2) lifts, applying a total average depth of 75mm of asphaltic concrete.

308.06. Finishing

After final compaction, the surface shall be smooth and free from cracks, ridges and loose material. Any ridges or undulations are removed by planing with a motor grader, and the resulting loose material removed from the area. The finishing and construction operations shall be completed before six (6) hours has elapsed from the time of addition of water to the mix.

The surface of the compacted base course shall be kept moist until a curing seal has been applied. Water shall be applied in a fine spray which does not segregate the cement from the soil particles.

308.07. Curing

A curing seal of emulsified asphalt shall be applied to the dampened surface at a temperature of 20°C - 50°C, and at a uniform rate of 2.5 litres per square meter. The seal covers the full width of the roadway and shall be allowed to cure thoroughly before the Engineer grants permission to continue further works.

308.08. Maintenance

The Contractor shall, within the Limits of Contract, maintain the soil-cement base course in good condition. Faulty areas are replaced for the full depth of the base course with fresh soilcement mixture or concrete. Surface depressions are brought up to proper grade by patching with asphaltic concrete prior to the application of the asphaltic surface course. Areas where the curing seal is removed by traffic or otherwise, shall be resealed immediately, at the Contractor's expense.

Measurements

The volume of work is measured in tons.

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 item below:

No.	Item	Unit of Measure
30801	Cement-stabilized base	Square Metre

CHAPTER 309. COATED MACADAM

309.01. General

The Coated Macadam shall conform to SNiP 3.06.03-85, chapter 9.

309.02. Aggregate

The aggregate shall consist of crushed rock or crushed gravel of angular shape and of such character that it will compact and interlock under rolling. It shall be of reasonably uniform quality throughout and free from clay, earth, dust or other deleterious matter.

309.03. Bitumen

The binder shall be Gudron as specified in the SNiP or ordered by the Engineer.

309.04. Preparation of the base or existing surface

If the surface to be treated contains holes or depressions such irregularities shall be repaired by removal of all loose material and replacement with a suitable patching mixture or other material approved by the Engineer, which shall be compacted to produce a tight surface conforming with the adjacent areas. Bumps and waves which impair the riding qualities of the surface shall be removed by scarification and re-compaction or other such means as shall be agreed or ordered by the Engineer. The base shall then be swept clean of all loose and foreign material.

309.05. Application of Choke aggregate

Immediately after the Coated Macadam has been applied and while it is still warm a light sprinkling of choke aggregate will be spread over the surface in just sufficient quantity to prevent sticking of the roller wheels. This will then be rolled and simultaneously with the rolling additional choke aggregate shall be added in small quantities and lightly broomed over the surface while rolling continues until the surface interstices between the coarse aggregate have been filled but without covering the coarse aggregate itself. The surface shall then be rolled until the stone is thoroughly inbedded into the binder and anchored in place. Rolling will be continued until the surface is hard and smooth and shows no perceptible movement under the roller.

309.06. Seal Coat

The surface shall be swept clean of all loose material and treated with a second coat of binder under the same conditions as in Sub-Clause 309.06 of this Clause. Immediately after application of the binder, cover aggregate will be spread and broomed uniformly over the surface.

309.07. Protection of Pavement

The seal coat will be applied as soon as practicable after the application of the choke aggregate and the surface course shall be protection from all traffic (other than that essential to the construction) until completion of the seal coat.

Measurements

The volume of work is measured in tons.

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 item below:

No.	Item	Unit of Measure
30901	Coated Macadam, Thickness 60 mm	Square Metre
30902	Coated Macadam, Thickness 80 mm	Square Metre

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.

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 400. VARIOUS

PREPARATORY WORKS, SITE INSTALLATION, ACCOMODATION OF TRAFFIC

Traffic Accommodation

During the entire construction period and independent of the weather, the traffic to be accommodated permanent on all bridges.

Temporary roads, crossing the riverbed, to be constructed, are according the design drawings.

Construction of temporary bypass (furnished with a proof surface), level crossing of railroad, barriers, appropriate railroad crossing, traffic signs for traffic diversion; incl maintenance of the road diversion and its access ramps (kept dust-, snow- and icefree during the entire time of use) and operation of barriers. Railroad crossing to be approved by the State Railway Corporation.

Payment

No.	Item	Unit of Measure
40001	Site set-up for the bridge construction, maintenance and removal after the bridge construction has been finished.	Lump-sum
40002	Traffic safety measures. Temporary carrying regulation during construction woks. Installation, service and remove.	Lump-sum
40003	Provide, assemble, maintain and remove all falsework and scaffolds, to be used during construction period, incl. temporary inspection equipment for the inspection and approval of the superstructure and piers by the engineer.	Lump-sum
40004	Temporary by-pass, accommodation of traffic (ravine/channel crossing), set-up, maintenance and removal after the bridge construction has been finished, incl. traffic safety measures. According sketch on the drawing.	Linear meter
40005	Construction of temporary bypass (furnished with a proof surface), level crossing of railroad, barriers, appropriate railroad crossing, traffic signs for traffic diversion; incl maintenance of the road diversion and its access ramps (kept dust-, snow- and icefree during the entire time of use) and operation of barriers. Railroad crossing to be approved by the State Railway Corporation.	Lump-sum
40006	Reserve on railroad crossing works for employers disposal.	Provisional sum

TECHNICAL SUPPORT

Working Drawings of the Bridges

The contractor shall provide working drawings according to the chosen construction system of all bridges (e.g. but not limited to: topographic setting-out, geotechnical investigations, reinforcement inc. steel-lists, pre-stress system, construction details) elaborated with CAD-system and submitted as DXF-file to the client on CD-Rom and hard copy in 3 copies to the Engineer for approval.

Structural analyses of the Bridges

Structural analyses for new construction parts of bridge, selected pre-stressed -system for pre-cast beams (pre-stress forces and pre-stress-assignment), construction-stages, temporary constructions and stability analyses. Corrections /amendments in 3 copies in English to the Engineer on CD-Rom for approval.

Construction (Progress) Photographs (digital) of the Bridges

Coloured photographs showing the progress of the works shall be taken every month from position to be selected by the Engineer. Prints of photographs shall not be less than 150 mm x 100 mm and shall be inscribed with the location, date when taken and a brief description or title.

The photographs shall be used for illustrating the monthly report.

On completion of the works, the digital photographs shall become the property of the Employer, i.e. the Contractor shall hand over all photographs on CD.

As-built Drawings for Bridges

The Contractor shall prepare and submit as-built drawings for all bridges showing the executed works and all subordinated elements and details (e.g. but not limited to topographic data, levels, reinforcement, construction details, landscaping, etc.) elaborated with CAD-system and submitted as DXF-file to the Engineer on CD-Rom and 4 hard-copies each.

Payment

No.	Item	Unit of Measure
40007	Structural analyses for new construction parts of bridges, selected pre-stressed -system for pre-cast beams (pre-stress forces and pre-stress-assignment), construction-stages, temporary constructions and stability analyses. Corrections /amendments in 3 copies in English to the Engineer on CD-Rom for approval.	Lump-sum
40008	Prepare one complete set of marked-up prints of all drawings concerning the road, including larger scale original drawings where necessary to clearly show adequate detail, and including all utility drawings for which modifications have been performed for or as part of this project.	Lump-sum

40009	Provide working drawings showing the chosen construction system of bridge (e.g. but not limited to: topographic setting-out, geotechnical investigations, reinforcement inc. steel-bar lists, pre-stress system, construction details, etc.) elaborated with CAD-system and submitted as DXF-file to the client on CD-Rom and hard copy in 3 copies to the Engineer (in English and Romanian language)for approval.	Lump-sum
40010	Provide Digital photo documentation of all the existing situation along the road before construction and submission on CD.	Lump-sum
40011	Construction Photographs of all construction phases of road works, culverts and utilities, recorded on CD.	Lump-sum
40012	Provide Digital photo documentation of all construction phases of bridge and submission on CDs.	Lump-sum
40013	Provide and prepare As-Built Drawings of the road (as but not limited to): topographic data, drainage components, utilities, details, etc. elaborated with CAD-system and submitted as DXF-file to the Engineer on CD-Rom and 4 hard-copies in Romanian and English each.	Lump-sum

MISCELLANEOUS

Illumination of Roads and Bridges

Roads and Bridges to be illuminated by street lights where shown in the drawings. Foundation or fixation is detailed shown in the drawings. Dia 75 mm PVC lining / sleeve pipes are embedded in the bridge caps to allow thread cables.

Type of street light according to clients detailed instruction.

Payment

No.	Item	Unit of Measure
40014	Provide and fix a year matrix 25 x 45 cm, marking the construction year on the bridge wing wall, according to the drawing or instruction.	Number
40015	Provide and install measuring bolts related to the geodetic survey, diameter 10 to 20 mm, length more than 120 up to 160 mm, made of brass, place according supervision engineer, including sureveying (to national grid) and all ancillary works and materials.	Number
40016	Provide and install of lining pipes, inflexible PVC, diameter 75 (100) mm including connections, adapters, accessories, hook wires, and closing caps according supervision engineer, including all ancillary works and materials.	Linear meter
40017	Construct cable duct, min 80x80x80 cm or size according to the prevailing regulations.	Number

PILE LOAD TEST

For each Bridge the following pile tests to be executed, one for each bridge.

- Static Pile Tests according to EDIN 1054: 2000-2012 (chapter (8.4.2 / page 56 ff)
- Dynamic Pile Tests according to EDIN 1054: 2000-2012 (chapter (8.4.3 / page 58 ff)

Not later than 30 days from the date of the letter of acceptance the Contractor shall submit to the Engineer for approval details of his method and equipment for the pile loading test.

Payment

No.	Item	Unit of Measure
40018	Provide, install and remove testing equipment and all construction materials needed to execute pile load tests to one bridge with piles.	Number
40019	Static and dynamic pile load tests (abutment, each one) according to EN/DIN 1054 or equal (according specifications item 400, "Bridges", piling), one on each abutment or pier.	Number
40020	Temporary piles necessary to pile tests, including all ancillary works and materials.	Number

DYNAMIC AND STATIC LOAD TEST ON BRIDGES

All bridges have to be subjected a live load test in order to ascertain that actual distortions under live load coincide with the distortion derived from respective calculations as part of the structural analysis.

At least one month before completion of a bridge the Contractor has to submit the program of testing to the Engineer for approval consisting in the different steps of live load application, the respective location selected for measurement, the kind and accurateness of measurement and the calculated results depending on applied load at these selected measurement points.

The live load test according to approved procedure shall be performed as soon as possible after completion of each bridge, but at least before the provisional handing over.

The results of the live load test have to be compiled in a report containing the preparatory calculations, the description of all live load applications with records of all consecutive measurement data and respective interpretation.

Payment will be made as lump sum for the successful performed live load test separate for each bridge.

Payment

No.	Item	Unit of Measure
40021	Provide 4 tipper trucks loaded with any material with a total weight of min. 25 to per truck, incl. transport and waiting time, off-loading and depositing of the material. The rate remains if the appointed test engineer needs less or more vehicles. Rate as per bridge.	Lump-sum
40022	Provision, installation, maintenance and removal of testing equipment provided by the independant test engineer, all equipment for the respective bridge.	Lump-sum
40023	Analysis of test results and provision of test report of the respective bridge in 4 copies to the Engineer.	Lump-sum

CHAPTER 401. REMOVAL OF EXISTING STRUCTURE

401.01. 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 leveling layer on bridge decks;
- Dismantling of PC reinforced concrete deck slabs;
- Demolition of reinforced concrete in infrastructure and deck elements;
- Demolition of the deteriorated elements of the reinforced concrete slope and channel protection;
- Demolition of reinforced concrete at deck beam joints;
- Demolition of deteriorated reinforced concrete stairs on bridge abutment slopes;
- Removal of metal expansion joint elements;
- Cleaning the collar beams at piers and abutment of waste.

401.02. Equipment

The following equipment will likely be required for works under this chapter:

- Crane for removal of bridge deck slabs length 6.0 m.; weight 5 tons;
- Crane for removal of walkway elements; weight 2 tons;
- Oxyacetylene cutting equipment;
- Compressor(s) with tools for demolition of concrete and of asphalt surfacing;

401.03. 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.

401.04. 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 meters 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 cubic meter for payment purposes.

Metal parapets dismantled and scrapped as unusable shall be measured in linear meters of parapet prior to demolition.

Demolition of metal expansion joint elements shall be measured in the linear meter.

Asphalt pavement to bridge decks shall be measured in square meters.

Cleaning of collar beams and pier heads shall be measured as a single item payable as a sum for each structure where cleaning is required.

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
40101	Removal of concrete parapets/guard rails of the bridge or embankment. Disposal of all demolished materials.	Cubic meter
40102	Dismantling and disposal of the steel handrails.	Linear meter
40103	Dismantling and disposal of the steel guard rails.	Linear meter

40104	Dismantling and disposal of reinforced concrete handrails.	Linear meter
40105	Dismantling of reinforced concrete sidewalks. Disposal of all demolished materials.	Cubic meter
40106	Removal and disposal of the asphalt pavement on the bridge deck.	Square meter
40107	Removal and disposal of the pavement on bridge approaches.	Square meter
40108	Removal of superstructure waterproofing including protective and leveling layers. Disposal of all demolished materials.	Cubic meter
40109	Dismantling of PC reinforced concrete deck slabs. Disposal of all demolished materials.	Cubic meter
40110	Miscellaneous demolition of reinforced concrete to bridge substructure and deck elements. Disposal of all demolished materials.	Cubic meter
40111	Removal of deteriorated elements of the reinforced concrete slope and channel protection. Disposal of all demolished materials.	Cubic meter
40112	Demolition and disposal of reinforced concrete to deck beam joints.	Cubic meter
40113	Demolition of deteriorated reinforced concrete stairs on abutment slopes. Disposal of all demolished materials.	Cubic meter
40114	Cleaning of piers and abutments caps of waste. Disposal of all materials.	Number
40115	Removal and disposal of metal expansion joint elements.	Linear meter
40116	Dismantling of precast approach slabs. Disposal of all demolished materials.	Cubic meter
40117	Cleaning of concrete used for joints between deck slabs from the sides. Disposal of all materials.	Lump-sum
40118	Demolition of masonry constructions. Disposal of all materials.	Cubic meter
40119	Dismantling of existing culvert sections. Disposal of materials.	Cubic meter

402.01. Introduction

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.

402.02. 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 Report, 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.

402.03. 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 up to 98% of proctor density. The moisture content and the properties of the soil shall be determined according to the Sub-Clause 201.11. For repairs to sloping surfaces, benches shall be cut in the existing surfaces.

402.04. Works acceptance

Acceptance of the work will be in accordance with chapter 002.04. 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 meters 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 meters 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:

No.	Item	Unit of Measure
40201	Excavation of embankment on the abutment area for new back-, wing-, retaining walls. Haulage and disposal of excess and/or unsuitable material.	Cubic meter
40202	Provide, place and compact selected fill for pits of abutments area, incl. levelling, compaction and preparation of surface.	Cubic meter
40203	Renewal of embankment at the abutments area. Provide, place and compact of suitable material to widening of existing embankment and reconstruct the slopes of the abutments.	Cubic meter
40204	Excavation/cavity of ravine/river bed in the bridge area. Haulage and disposal of excess and/or unsuitable material.	Cubic meter
40205	Excavate foundation strips (e.g. 0.60 x 0.80).	Cubic meter
40206	Provide, maintain and remove dewatering system (pumps, etc.) for ground water of entire construction work.	Lump-sum
40207	Crushed stone layer on the foundation bed, H= according to requirements.	Cubic meter
40208	Sheet Piling for abutments, free sheet wall as protection of building pits (e.g. steel elements). Sheet length according stability analyses, interlocked, driven and removed; as required with anchoring; spayment: horizontal lenght x driven depth.	Square meter

CHAPTER 403 CONSTRUCTION OF BRIDGE SUBSTRUCTURE (FOUNDATION, PIER AND ABUTMENT)

403.01. Introduction

This work includes the construction of foundation piers and abutments of cast-in-situ reinforced concrete on an earth foundation for the widening of the existing bridges. The foundation piers and abutments shall be constructed in compliance with the design as approved by the Engineer.

403.02. Materials

The materials and the precast units for the works under this chapter must be compliant with the following requirements:

Concrete mixture and components	Design, SM GOST 26633-91 and SNiP 3.06.04-91
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Crushed stone used for the pad under the piers and abutments foundation	SM GOST 8267-93
Reinforcing bars and built-in elements	Design and SM GOST 5781-82
Bituminous Primer for waterproofing	VSN 32-81
Bituminous Mastic for waterproofing	VSN 32-81

403.03. General requirements

The pier construction works should be performed in compliance with the requirements of SNiP 3.06.04-91

403.04. Equipment

The following equipment should be provided:

- Crane formounting and dismantling of the formworks, for installation or reinforcing grids and for concrete supply by a bucket;
- Excavator for excavation of foundation pits;
- Welding machine for welding works;
- Vibrator for compaction of the concrete, cast into a structure;
- Pump for water pumping from a pit.

403.05. Excavating for the pier foundations and backfilling

The works should be performed in compliance with the requirements set out in Chapter 203.

403.06. Formworks

Formworks should be carried out in compliance with the requirements of SNiP 3.06.04-91.

403.07. Reinforcing Works

The reinforcing works should be carried out in compliance with SNiP 3.06.04-91. It is not allowed to use reinforcing bars without a certificate of the manufacturing plant. The replacement of the class, type and diameter of the reinforcing bars specified by the Design must be agreed with the Engineer. The reinforcing bars and the built-in elements, used in a structure, must be clean of rust, dirt, dust and oil strains.

The bars, which are not welded, must be connected by overlapping according to the Design.

The connection of reinforcing bars and of built-in elements by welding must be performed according to the Design and in compliance with the requirements of SM GOST 14098-95.

403.08. Concrete Works

Preparation, transportation and casting of concrete, as well as concrete curing during its hardening in the structure, must be performed in compliance with Specifications, SM GOST 26633-91 and SNiP 3.06.04-91.

The concrete mix, which lost its workability by the moment of casting, cannot be used in the structure supposed for concrete casting. It is prohibited to restore the workability of a mix by adding water in situ. The minor defects found after removal of the formworks should be removed using cement-and-sand mortar in accordance with Chapter 417.

403.09. Waterproofing

Waterproofing should be carried out in compliance with SNiP 3.04.03-85 and VSN 32-81. The pier surfaces, buried in the ground, must be waterproofed by coating in two layers. Waterproofing should be performed on a primed concrete surface. The surface to be waterproofed must be dry and clean of oils, dirt and dust. Waterproofing Works should be carried out at an outdoor temperature above plus 5°C.

403.10. Work acceptance

The acceptance of the works under this chapter shall be in compliance with chapter 002 provided the works are performed in compliance with the Design, SNiP 3.06.04 -91, VSN 32-81 and Specifications, being approved by the Engineer.

Measurement

The works under this chapter shall be measured in cubical meters of R/C used.

Payment

The accepted volume, measured as described above, shall be payable according to unit rates specified in the Contract, contained in the bid, for the Payments items given below. This payment represents the full amount of remuneration for the works performed under this chapter.

The payment shall be done for the following items:

No.	Item	Unit of Measure
40301	Lean Concrete, class C 8/10, min. 10 cm thickness incl.formwork (install and remove) as blinding/soling under pile slabs, foundations, approach slabs, etc.	Cubic meter
40302	Fill of cavity on existing abutments with concrete, class C 8/10.	Cubic meter
40303	Piles foundation Cast-in-situ Bored Piles for Abutments, diameter 1.20 m, length up to 35 m, , including drilling of borehole and piping, structural steel as spacer rings and pile point bracing, concrete class C25/30, reinforcement steel, disposal of drill cuttings and earthy material, and all ancillary works and materials.	Linear meter

40304	Piles foundation Customize pile heads for connection to the pile head slab, including truncation of pile heads to a level of 5 cm above bottom edge of slab, protection of connecting reinforcement during removal of concrete and disposal of debris.	Number
40305	Drive against reinforced concrete piles. Delivery and assembly of precast concrete piles, according SNIP for the bridge construction including all devices necessary for installation. Piles 35/35 cm or diameter 60 cm, total length of one pile approximate 12-18 m.	Linear meter
	Concrete class C25/30; including formwork (install and remove), cast, com-pact, cure, protect, provide and install reinforcing steel, all ancillary works and materials	
40306	for the construction of pile cap on abutments.	Cubic meter
40307	for the construction of flat foundation - widening of piers and abutments	Cubic meter
40308	for the construction of flat foundation - new wing-/retaining walls	Cubic meter
40309	for the construction of flat foundation - new back- with wing walls	Cubic meter
40310	for the piles foundation of precast elements for widening of piers or abutments	Cubic meter
40311	for the strip foundation of slopes foundation	Cubic meter
40312	for the construction of new back-, wing-/retaining walls	Cubic meter
40313	for the construction of new abutments incl. backwall and wingwalls.	Cubic meter
40314	for the widening of existing piers, incl. cross beam	Cubic meter
40315	for the widening of existing abutments, wing-/retaining walls	Cubic meter
40316	for bearing / seismic plinth	Cubic meter
40317	Precast reinforced concrete columns for new piers and abutments. Production accordig to site.	Cubic meter
40318	Precast reinforced concrete caps for new piers and abutments. Production accordig to site.	Cubic meter

CHAPTER 404. CONSTRUCTION OF BRIDGE SUPERSTRUCTURE

404.01. Introduction

The works described in this chapter cover the provision of bridge precast reinforced concrete beams and slabs, of various lengths at new bridges and replacement of deteriorated reinforced concrete slabs and beams at existing bridges. The works consist of manufacturing, transporting, and handling, execution of the bearing parts, and transversal slabs jointing. The work of demolishing bridge elements and dismantling of the existing reinforced concrete slab decks do not form part of this chapter and are included in chapter 401. The work of waterproofing new bridge deck and repaired bridge deck is covered in chapter 408.

404.02. Materials

All materials and pre-cast elements used for the works of this chapter must comply with:

Concrete and components	Technical Report, SM GOST 26633-91 and SNiP 3.06.04-91
Sand Cement Mortar	Technical Specification, SM GOST 28013-89 and SNiP 3.06.04-91
Reinforcing bars and built-in elements	Technical Report, SNiP 3.06.04-91
Reinforced concrete slabs with ribbed bars for the superstructure	Technical Report: SNiP 3.06.04-91
Bituminous felt in rolls	SNiP 3.06.04-91

404.03. Equipment

The following equipment will be required:

- Crane for the mounting of deck slabs, weight to 3 tons;
- Welding equipment for welding works;
- Vibrators for compaction of the concrete cast-in-situ.
- Concrete mixer with pumps

404.04. Mounting the deck slabs

Execution of the pre-cast reinforced concrete slabs, acceptance of the executed items, and their transporting and erection are to be carried out in compliance with the requirements of the Technical Report and SNiP 3.06.04-91. The slabs for the superstructure are to be mounted on a bearing platform, consisting of a layer of sand cement mortar 2-3cm in thickness placed on top of bituminous felt layer, Slabs shall be placed while the mortar is still soft. Slabs jointing has to be done in compliance with the Technical Report.

404.05. Concrete casting and curing of construction joints

Concrete casting and curing at the joints will be done as described in the Clause 402.08.

404.06. Piling

General

Piling shall conform in all respects with the principles contained in standard SNiP 2.02.03 -85.

In addition to submitting the records required, the Contractor shall report immediately to the Engineer any circumstance which indicates that the ground conditions differ from those expected by the Contractor from his interpretation of the soil survey so as to affect materially the bearing capacity of the pile.

Maximum permitted tolerances are:

- Position 75 mm in either direction at cut-off level
- Verticality 1 in 75 deviation from vertical
- Rake 1 in 25 deviation from specified rake

Where piles have not been positioned within the limits described in the Contract, no method of forcible correction will be permitted.

Pile load test ref to chapter 400 "VARIOUS".

404.07. Precast Concrete Piles

General

The manufacture, storage, handling and lengthening of reinforced concrete and pre-stressed concrete piles shall comply in all respects with Series 1400-1700 of this Specification, with the following amplifications:

Piles shall be supported, handled and pitched, as described in the Contract.

Where piles have to be stored, they shall be placed on sufficient supports on firm ground to avoid damage by excessive bending.

Each pile shall be marked indelibly to show its identification number, length and date of casting. Pre-stressed concrete piles shall be marked with the pre-stressed force applied.

Driving

Piles shall not be driven until at least 28 days after casting unless agreed by the Engineer. The Engineer shall be notified 24 hours before the commencement of driving. Piles shall be driven to the set or depth and in the sequence of driving approved by the Engineer. The set shall be taken in the presence of the Engineer or his Representative unless permission to the contrary has been obtained in writing.

Lengthening of Piles

Unless another method is approved by the Engineer, the main or splicing reinforcement shall be stripped of concrete for a distance of 40 times its diameter and additional reinforcement securely tied in position. Alternatively, subject to the Engineers approval, the reinforcement may be exposed for a minimum distance of 300 mm and additional reinforcement butt welded in position.

Driving shall not be resumed until:

- the cube strength of the concrete in the extension is at least equal to the specified 28 day cube strength of the concrete in the pile and
- the approval of the Engineer has been obtained.

Removal of Surplus Length

Any length of pile surplus to that required for incorporation in the substructure shall be cut off and removed.

Risen Piles

Piles which have risen as a result of driving adjacent piles shall be re-driven to the requirements of the Engineer

404.08. 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 constructing new bridge decks and 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 new bridge deck elements in place, mounted and jointed.

No.	Item	Unit of Measure
40401A	Delivery and assembly of precast pre-stressed concrete T-beams, according SNIP for the bridge construction including all devices necessary for installation. Length: 21 m, height: 1.23 m.	Number
40401B	Delivery and assembly of precast pre-stressed concrete T-beams, according SNIP for the bridge construction including all devices necessary for installation. Length: 33 m, height: 1.53 m.	Number
40402	Precast reinforced concrete beams for widening of superstructure incl. connection to existing edge beam. T-beams according SNIP, H=1,08 m, L=16,3-19,0 m.. Production accordig to site.	Cubic meter
40403	Precast reinforced concrete beams for widening of superstructure incl. connection to existing edge beam. T-beams according SNIP, H=0,93 m, L=11,36 -15 m. Production accordig to site.	Cubic meter
	Concrete class C30/37; including formwork (install and remove), cast, compact, cure, protect, provide and install reinforcing steel, all ancillary works and materials	
40404	for the construction of reinforced concrete in situ spans to widening of existing bridge superstructure, incl. connection to existing edge beam.	Cubic meter
40405	for the construction of the deck slab on the precast T-beams of superstructure	Cubic meter
40406	for the construction of support beam (cross beam) for pre-stressed beams on abutments, forehead-wall and connection underneath, incl. formwork, as shown in the drawings.	Cubic meter
40407	for the construction of the cantilever to superstructure widening of existing bridges	Cubic meter
40408	Precast reinforced concrete slabs 6 and 9 m length H=0,3 and 0.45 m, respectively. Production accordig to site.	Cubic meter
40409	Mounting of existing slabs and beams of superstructure that were unmounted and repaired.	Number

CHAPTER 405. BRIDGE APPROACH SLABS

405.01. Inroduction

The work in this chapter covers the execution of approach slabs to new bridges and to existing bridges where there are no slabs and the repair/replacement of damaged or incorrect approach slabs for spans greater than 10 meters. Works will be carried out on the basis of the Project, Technical Reports and the Design type 3.503-41 and include the demolition and removal of existing slabs, provision of crushed stone bed, the provision and placement of new approach slab.

405.02. Materials

Materials, precast units and elements for the works of this chapter must comply with the following requirements:

Concrete and components	Technical Report, 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	Project-tip 3.503.-41
Bitument treatment for waterproofing	VSN 32-81
Bitumunous mastic for waterproofing	VSN 32-81
Reinforced concrete approach slab	Technical Report,
Approved Backfill	SM GOST 23735-79 and Chapter 406

405.03. General requirements

The works in this chapter will not be executed until completion of any works required under the provision of chapter 402. 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:

- Concrete mixer with pumps for concrete curing
- Vibrators for compaction of the concrete cast-in-situ;

405.05. Crushed stone bed for backfill

The bed will be executed of graded crushed stone to achieve an interlock according to SNiP 3.06.03-85

405.06. NOT USED

405.07. Casting and curing of concrete at the approach slab

Casting and curing of concrete at the approach slab shall be in compliance with Sub-Clause 403.08.

405.08. Waterproofing

The surface of the approach slabs must be waterproofed. The works must be executed as described in the Clause 403.09.

405.09. Works acceptance

The acceptance and repair works of the approach to the bridge shall be in accordance with the requirements of chapter 002. The works shall comply with the Technical Specification, Design type 3.503-41, SNiP 3.06.04-91 and SNiP 3.09.01-85.

Measurements

The Works under this chapter shall be measured for payment only as the square meters 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:

No.	Item	Unit of Measure
40501	Concrete class C25/30; including formwork (install and remove), cast, com-pact, cure, protect, provide and install reinforcing steel, all ancillary works and materials for the construction of approach slabs.	Cubic meter
40502	Furnishing and installing of precast reinforced concrete approach slabs.	Cubic meter

CHAPTER 406. Concrete safety parapet

NOT USED

CHAPTER 407. EXPANSION JOINTS

407.01. Introduction

The present works consist of the replacement of the damaged elements of the expansion joints using new elements for the existing bridges without any expansion joints and for the newly executed bridges. For bridge decks with length up to 12 m joints will be executed according to drawings. Joints will be executed using an approved

proprietary expansion joint, appropriate to the size of deck and incorporating a waterproof

407.02. Materials

The materials of the joint structure shall meet the following requirements:

(i) expansion profile

- elastomere (polymer SBR/BR)
- shore hardness A 58 ± 5 SHE
- tensile strength min. 14 N/mm²
- elongation at break min 400 %
- ageing resistance (7 days at 70°C)
 - hardness + 8 SHE
 - tensile strength ± 15 %
 - elongation ± 25 %
- ozone resistance
 - 0.5 pphm/48 h "0", no visible cracks
- compression deformation
 - 72 h/20°C max. 20 %
 - 22 h/70°C max. 25 %

(ii) steel elements

- clamping profile $f_y = 360$ N/mm²
- bolts high tensile
- anchors to concrete $f_y = 460$ N/mm²
- corrosion protection 80 μ m hot-dip galvanised, 2x 80 μ m iron-oxide/epoxy-resin coats

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.

Joints shall be installed in compliance with the Manufacturer's Specifications / instructions and drawings. Expansion joints shall be assembled and fitted only when air temperatures are above +50C.

407.04. Modular Expansion Joint Specifications:

- 1) The Expansion Joints shall be of the modular type, consisting of load-carrying steel edge beams integrated into the adjacent structural elements, centre beams (in case the movement exceeds 80 mm) and one (movement ≤ 80 mm) or several (movement >80 mm) elastomeric sealing elements. and hot-zinc galvanised as protection against corrosion
- 2) The Expansion Joint shall be designed to accommodate the movement and rotation demands given hereafter.
- 3) The Expansion Joint shall be absolutely watertight. All elements below the bridge deck surface have to be protected against humidity percolating from the surface of the bridge.

- 4) All metallic parts of the Expansion Joint shall be made of hot-rolled steel. To achieve the required precision, the centre- and edge- beams shall be made of two steel elements which are connected by longitudinal submerged arc-welding process, executed by an automated welding procedure. No extruded steel beams shall be allowed.
- 5) No transverse butt welds of the steel beams in the roadway area shall be allowed –except for connecting welds in case of lane-by lane installation.
- 6) The Expansion Joint shall be delivered to the site as one single unit. No assembly works (apart from a longitudinal joint extension due to transport length limitations or lane-by-lane installations sequences) are allowed on site.
- 7) It must be possible to exchange the strip seals up to minimum gap opening of 30 mm. This must be proven by a demonstration to the client.
- 8) The strip seals must be able to adjust automatically gap openings up to 120 mm and then still fulfill their functionality (i.e. not get torn out of the steel sections but maintain the watertight connection of two steel beams).
- 9) Vehicle wheels shall not contact the sealing elements.
- 10) The strip seal shall be connected to the steel beams by a positive and a non-positive interlocking system. It shall not be fixed with screws, bolts, glue or other additional fixation devices.
- 11) The strip seal shall not be designed to transfer any loads (horizontal or vertical).
- 12) The motion control system shall consist of series of only compression loaded urethane elements. The minimum control force shall be developed when the joint is completely closed, the maximum control force shall be developed when the joint is completely opened. A progressive force-increase has to be guaranteed.
- 13) For swivel joist joints:
- 14) A motion control system based on springs is not allowed. The motion control has to be done by a kinematic system with a sufficient resilience to compensate temperature expansion as well as manufacturing and installation tolerances. The joint has to accommodate the specified movements in all directions independently.
- 15) The Expansion Joint is an integral element of the structure, i.e. anchor elements to be welded to the edge beams of the Expansion Joint and properly embedded into the concrete or welded to the steel superstructure. Subsequent bolting is not allowed.
- 16) The connection between centre beams and support bars shall be realised with full-penetration welding, no fillet welding or screwed connections shall be allowed.
- 17) All fatigue-critical connections (e.g. centre beams – support bar) have to be tested by an independent laboratory, experienced with the execution of dynamic testing. A minimum service life of 40 years has to be shown by fatigue testing.
- 18) The Expansion Joint manufacturer has to show a minimum experience of 10 years in supplying Expansion joints of similar movement range.

407.05. Installation

The Expansion Joint shall be installed in the recesses of the deck slab and abutment/backwall.

The anchors (loops) of the joint structure are to be connected with the reinforcement of the structure by stirrups or hooks and longitudinal bars passing through the loops of the anchors.

The gap between both sides of the joint structure is to be fixed dependent on the actual temperature of the superstructure in accordance with manufacturer's instructions.

The recesses have to be filled with well compacted concrete after alignment.

407.06. Works acceptance

The repairing of the expansion joints for the existing bridges and the construction of the expansion joints for the new 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 and repair 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.

No.	Item	Unit of Measure
40701	Provide and install expansion joints in the carriageway and sidewalks, watertight, e.g. (MAURER & SÖHNE, type D 80, hot - zinc galvanized) or similar, corrosion prevention, with strip and a course as shown in the drawings and all ancillary works and materials. Total dilatation 80 mm.	Linear meter
40702	Provide and install simple expansion joints elements as overlap of existing deck and back wall. According drawings, material hot-dip galvanized.	Linear meter
40703	Cleaning of joints between existing deck slabs and back wall. Disposal of all materials.	Lump-sum

CHAPTER 408. WATERPROOFING

408.01. Introduction

The works under this chapter include the replacement of the waterproofing to the carriageway and walkways of existing bridge decks and the waterproofing of the decks on new bridges. The works of waterproofing on existing bridges includes the application of a regulating layer of concrete 30 mm thickness, the waterproofing layer of 8 mm thickness and a protection layer of asphalt mastic of 40 mm thickness. During the replacement of waterproofing works on existing bridges it will be necessary to remove the existing protection layer waterproof membrane and regulating layer, . The reinstatement of the asphalt pavement over these works is not included in execution work of waterproofing and is payable under the appropriate items of Chapter 305.

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 31-82.

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, 6 mm thick	VSN 32-81 and manufacturer's specifications
Concrete for the levelling and asphalt mastic protection course 40mm	Technical Specification, Project-tip course 3.503.1 - 101
SMA 50mm	SM STB 1033-2008, Chapter 305 of these specifications

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.

The existing levelling course on the carriageway will be taken out down to the structural deck level.

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 leveling course of the deck, adhesion will be achieved by 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 asphalt mastic protecting course must be laid immediately after waterproofing. Waterproofing works must be carried out only when air and concrete deck temperatures are higher than 5°C. The waterproofing will be covered with a 40 mm asphalt mastic protection layer followed by a layer of SMA, as specified in chapter 412.

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. Works acceptance

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:

No.	Item	Unit of Measure
40801	Preparation of the concrete surface for sealing. Removal of laitance from concrete surface, sand blasting or equivalent, surface cleaning of superstructure.	Square meter
40802	Provide and apply epoxy prime and seal coat on the concrete surface prior to bituminous sealing.	Square meter
40803	Provide and apply 2x bituminous felt, reinforced with fibreglass mesh, as waterproof sealing of the superstructure, thickness 5 mm, properly welded first and second layer.	Square meter
40804	Provide and apply bituminous protection layer made from mastic asphalt, thickness 40 mm, over the entire carriageway between the sidewalks. Mastic asphalt 0/11, (gravel or crushed stone material, crushed and natural sand, filling mater.	Square meter
40805	Provide and apply synthetic resin (for prime coat) and bituminous sealing compound to seal joints along wearing course and caps, expansion-joints, gully-frames, incl all ancilliary works	Linear meter
40806	Provide and apply water and damp proof bituminous coat (prime coat + final coat) on all concrete surfaces with earth and water contact.	Square meter
40807	Provide and apply 1mm (1.6 kg / m2) epoxy resin primer as seal coat according to the instructions of the manufacturer on surface of sidewalk.	Square meter
40808	Provide and apply 2mm (3.2 kg / m2) epoxy resin primer as second coat with spread quartzite sand 1-2mm, to obtain a corporate appearance of walkway and a homogeneous non-slippery surface on walkways.	Square meter

CHAPTER 409. SAFETY BARRIERS

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

416.

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 3.06.0491, this specification
Metal safety barriers	Project Drawings, SM GOST 26804-86
Paint	SM GOST 26804-86 and SNiP 3.04.03-85, SNiP 2.03.11-85

409.03. Working requirements

Execution of the works of metal safety barriers on embankment shall be in accordance with the requirements of chapter 601 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 601 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 601.

409.04. Works acceptance

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 and Payment

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.

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
40901	Provide and instal of bridge type steel guardrail H=0,75 m including anchoring, guardrail supports and all ancillary works and materials. Hot-dip galvanized material.	Linear meter
40902	Provide and instal of bridge type steel guardrail H=1,10 m with one steel tube. Including anchoring, guardrail supports and all ancillary works and materials. Hot-dip galvanized material.	Linear meter

40903	Delivery and installment of a single guard-rail on the shoulder of the bridge area including approaches according to standard No. 503-0-17. Connection to the guard rail on the sidewalk. Anchorage of the poles into the earth. Pole length 1.80 m, distance 2.00 m, hot-dip galvanized material.	Linear meter
40904	Provide and instal of 2 sided bridge type steel guardrail H=0,75 m on the midle of the carriageway including anchoring,guardrail supports and all ancillary works and materials. Hot-dip galvanized material.	Linear meter

CHAPTER 410. SURFACE WATER DISPOSAL

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 design Design type 503-09-7.84. Chutes are made using cast-in-place reinforced concrete and stones. 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.

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 SNiP 3.04.03-85.

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, which 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 coordinated 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. Works acceptance

Works under this chapter will be accepted on the basis of compliance with the drawings of the Design type 503.09-7.84 and relevant specifications and their acceptance by the Engineer.

Measurement

The construction of chutes will be measured in linear meters 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:

No.	Item	Unit of Measure
41001	Provide and install bridge drainage system, gully ~30 x 50 cm, grate ~30 x 40 cm with inlet chamber and swan neck down-pipe pipe made of cast iron (pipe Ø 150 mm) incl fittings and galvanized supports/fixations, ancilliary works and materials..	Number
41002	Core drilling through pre-stressed beams for drainage pipes, Ø ca 20 cm, L= 15cm, incl all ancilliary works, use of machines and materials.	Number
41003	Provide and install dewatering pipes of galvanized steel, incl. anchoring. D=150 mm.	Linear meter
41004	Provide and place curb stones, 15/30 cm, for slope protection, for connection shoulder to end of sidewalk, including lean concrete support 10 to 14 cm and lean concrete bracing at the back of the curb.	Linear meter

41005	Construct 60cm wide dewatering channel on slopes, in abutment area, made of concave riprap in concrete, incl. steel mats and curb stones 10/30 cm.	Linear meter
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CHAPTER 411. ACCESS STAIRS ON SLOPES

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.

411.02. Materials

The materials, precast units and prefabricated items for use in this work shall be in accordance

Crushed stone for the bed underneath the stairs	SM GOST 8267-93
Concrete and components	Project Design, SM GOST 26633-91 SNiP 3.06.04-91
Reinforcing bars and build-in elements	Project Design, SM GOST 5781-82
Metallic handrails for the stairs	Project Design

The materials used for reinforced concrete stairs shall comply with the requirements of chapter 402.

The handrails and all fixings and fittings shall be hot dip galvanised after fabrication in accordance with the standards for guardrails.

The paints used shall comply with the requirements of SNiP 2.03.11-85 and design drawings 3.04.03-85.

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. Works acceptance

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 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:

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

No.	Item	Unit of Measure
41101	Construct concrete stairway on slopes. 10 cm thick lean concrete C8/10, and curb stones 10/30 cm. Concrete class C20/25, width 80 cm, riser / height of steps= 20cm, tread of step= 30cm on embankment, incl. Formwork and reinforcing steel.	Linear meter
41102	Repair works of existing slope access stairs of concrete, class C20/25 incl. formwork and reinforcing steel (e.g. steel mats).	Linear meter
41103	Provide and place of crushed stone for the bed underneath the stairs, layer of 10 cm.	Cubic meter
41104	Provide and install steel handrails for the slope stairs including anchoring, handrail supports, and all ancillary works and materials as shown on drawings. Hot-dip galvanized material, primer and final coat.	Linear meter

CHAPTER 412. EMBANKMENT SLOPE PROTECTION

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.

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***

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 402.

The demolition, removal and cleaning work required to prepare damaged or deteriorated protection for repair with reinforced concrete, are included in chapter 401.

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 carry 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. Works acceptance

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 402.

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
41201	Slope protection on the abutments area; reinforced concrete, class C20/25, thickness of 13 cm; cast, com-pact, cure, protect; provide and install reinforcing steel (steel mats), incl. a layer 10 cm of crushed stones, formwork of expansion joints and necessary earthworks.	Square meter
41202	Repair works to existing slope protection on the abutments area. reinforced concrete, class C20/25, thickness about 13 cm; incl. a layer 10 cm of crushed stones and necessary earthworks.	Square meter
41203	Protection of ravine/channel bed beneath bridge. Reinforced concrete, class C20/25, thickness of 13 cm; cast, com-pact, cure, protect; provide and install reinforcing steel (steel mats), incl. a layer 10 cm of crushed stones, and formwork of expansion joints.	Square meter
41204	Construction of Rip-rap for the slope protection of scour including excavation works and removing excavated ground.	Cubic meter

CHAPTER 413. ASPHALT CONCRETE PAVEMENT

413.01. Description

The works in this chapter cover the application of SMA 50mm surfacing to the completed bridge deck between bridge walkways (on roadway) and as protection to the shoulders on the approaches.

The work of demolishing and removing asphalt pavement on bridge decks is covered in chapter 401.

413.02. Materials

The materials for use in the works of this chapter shall conform to the following requirements:

SMA 50mm	Chapter 305 and SM STB 1033-2008
Asphalt mastic protection layer 40mm	
Crushed stone at the shoulders surface	SNiP 2.05.02-85, SM GOST 8267-93

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 50mm of Stone Mastic Asphalt (SMA). . Laying will be in accordance with the requirements of chapter 308 for machine laid asphalt. Asphalt to walkways will be laid in compliance with the requirements of chapter 307. Asphalt mastic sealing protection layer will be laid by hand.

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 303, 305 and 307. 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 meters 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:

No.	Item	Unit of Measure
41301	Provide and apply 50 mm bituminous cover layer (stone mastic asphalt) on the superstructure over the entire carriageway. Works to be executed together with wearing course of the adjacent road surface.	Square meter

CHAPTER 414. PEDESTRIAN BRIDGE RAILING

414.01. Introduction

The works consist of the provision of new metal pedestrian safety railing, the repair of existing railing and cleaning and painting of all the railings.

414.02. Materials

The materials and elements shall comply with the following requirements:

Standard sections of metal pedestrian railing	Technical Specification, Design type 3.503.1-81
Paints	SNiP 2.03.11-85, SniP 3.04.03-85,

414.03. General Requirements

Metal pedestrian safety railings shall meet the requirements of the Design tip 3.503.1-81 or according to drawings. The bent and damaged elements of the existing railings shall be straightened, reworked 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 railing elements.

Painting of railing shall to be executed according to the SNiP 3.04.03-85, CPE 04.03-2005 and SNiP 3.06.04-91. Before painting, all old paint, rust, grease and oil and any other contaminants shall be removed and the railing elements cleaned to bright metal. Immediately after cleaning, the railing elements shall be given a full coat of zinc rich, epoxy based, cold galvanizing compound followed by two coats of calcium plumbate primer.

Two coats of paint will be applied: prime coat (0.1-0.15l/m²); final coat (0.15-0.20l/m²). Welded parts are to be painted with zinc paint

The undercoat and balance of the approved paint system shall follow within one week of the primer. The color and quality of the paints to be applied shall be approved by the Engineer.

414.04. Work Acceptance

Acceptance of the works of pedestrian railings to bridge walkways will be under chapter 001. The works shall be in accordance with Design tip 3.503.1-81 or final design and shall be to the satisfaction of the Engineer.

Measurement

The works related is the provide assembly and including anchoring and repair of the pedestrian railings 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:

No.	Item	Unit of Measure
41401	Provide and install steel handrails, H=1,10 m including anchoring, handrail supports, primer and final coat and all ancillary works and materials as shown on drawings. Hot-dip galvanized material.	Linear meter
41402	Repair of damages existing steel handrails, incl. Anchoring. Provide and install of missing parts. Painting (primer and final coat).	Linear meter

CHAPTER 415. BRIDGE BEARINGS

415.01. Introduction

The works of this chapter include the provision of bearing pads of reinforced rubber to new bridge decks and existing bridge decks where no bearings currently exist. The works include the necessary temporary works to enable jacking of bridge decks to allow preparation of seating, repair of concrete and insertion of rubber bearings.

The works also include the cleaning and painting of existing steel bearings.

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, SNiP 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
Cement Mortar	SM GOST 28013-89

415.03. Equipment

The following items of equipment are likely to be required:

- Jacking capacity adequate to lift the estimated superstructure weight with a factor of safety of 1.3 (See Special Specifications for bridge details)
- Temporary works for installing and controlling jacking, providing support and load distribution
- Grit blasting equipment for rust cleaning surfaces of steel rocker bearings
- Autocrane for assembly and dismantling of the temporary works.

415.04. Lifting bridge decks for mounting of rubber bearings

The handling of bridge decks during rubber bearing installation must be done in accordance with VSN 86-83 and SNiP 3.06.04-91. The temporary works must be in accordance with the SNiP III-18-75 and SNiP 3.06.04-91. The jacking arrangements shall be such as to ensure that the whole of the span is lifted uniformly with no distortion or applied stresses from the lifting operation. Lifting of the span at one end only is not permissible.

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

Steel bearings with substantial areas of exposed steel work require be cleaning and painting. The steel elements of such bearings shall be sand or grit blasted to bright metal. Care shall be taken during the cleaning operation that no damage is caused to reinforced concrete elements of the bearings or to surrounding concrete. Such concrete shall be shrouded or otherwise protected throughout the cleaning process.

Immediately after cleaning the bearings shall be examined for defects. If serious defects are found the Engineer will direct what steps are to be taken.

Painting shall be carried out using pneumatic or approved airless spray and shall only be carried out during calm, dry weather at a temperature over +5°C, in accordance.

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 and the painting of bearings 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 417. Cleaning and painting of bearings shall be measured by the number of bearings cleaned 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:

No.	Item	Unit of Measure
41501	Provide and install rectangular elastomeric laminated/reinforced bearings fixed/free to move, maximum load (transverse direction of the structure) = 1.4 MN (e.g. Gumba), on prepared areas on the top of the abutments and piers, including preparation of the supporting / seating layer made of an appropriate epoxy mortar and galvanized steel plates, and all ancillary works and materials, as shown on the drawings and according to contractors calculations: 300 x 400 x 85 mm	Number

41502	Provide and install galvanized steel plates for jack points as shown in the drawings bottom and superstructure incl all ancillary works and materials.	Number
41503	Cleaning of existing bearings and Top of cross beams of concrete used (rests). Disposal of all materials.	Lump-sum
41504	Jacking superstructure, furnishing and installing neoprene bearing pads	Number

CHAPTER 416. *SLAB TO BRIDGE DECK, BRIDGE WALKWAY, PARAPET AND CONCRETE SLOPE LAYER*

416.01. Description

The works covered in this chapter include cast in situ reinforced concrete slabs forming part of the bridge deck, the parapet, concrete slope layer and the forming of reinforced concrete walkways on existing and new bridges. The works shall be executed in accordance with the requirements of the drawings and specifications and of SNiP 3.06.04-91.

416.02. 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 items	Technical specification, SM GOST 5781-82, SNiP 3.06.04-91
Epoxy glue	SNiP 3.06.04-91, Appendix 10

416.03. General conditions

The works shall be executed in accordance with the requirements of this technical specification and of SNiP 3.06.04-91

416.04. Equipment

The following equipment will be required for works under this chapter:

- Crane, for erection and dismantling of formwork, installation of reinforcing mesh and placing concrete;
- Drill for making holes in the concrete of a diameter up to 20 mm, for connections;
- Welding equipment;
- Oxyacetylene/Airacetylene burner for bending reinforcement for the parapet foundation;
- Vibrators for compaction of cast-in situ concrete.

416.05. Formwork

Formwork shall be in accordance with the requirements of SNiP 3.06.04-91.

416.06. 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 40 bar diameters and in compliance with requirements of the Technical Specification.

Where the welding of reinforcement and embedded elements is unavoidable the work shall be executed in accordance with the requirements of SM GOST 14098-95. Welding of reinforcement shall be avoided wherever possible and shall not be carried out without the explicit permission of the Engineer.

416.07. 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.

416.08. 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 shall be measured in cubic meters of reinforced concrete used in work.

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 embedded 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:

No.	Item	Unit of Measure
41601	for the construction of caps (sidewalks), including anchoring to existing spans; workmanship according drawings.	Cubic meter
41602	for the construction of the concrete leveling layer on the existing deck beams.	Cubic meter

CHAPTER 417. CONCRETE REPAIR

417.01. 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 major deteriorations;
- execution of works on the superstructure elements connecting joints;
- repair works of the infrastructure elevation;
- execution of the slope for water run off on the cross beams;
- 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 major failures 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

417.02. Materials

The materials used for the works described in this chapter shall be in accordance with the following requirements:

Polymer-based mortar and concrete	SNiP 3.06.04-91, EN 1504-3
Polymer- modified, cement-based mortar and concrete	SNiP 3.06.04-91, EN 1504-3
Concrete	SM GOST 26633-91, Drawings and SNiP 3.06.04-91
Cement-based mortar and concrete	SM GOST 26804-86, SNiP 3.06.04-91, EN 1504-3
Active pigments for reinforcement coating	SM GOST 5781-82, ENV1504-9
Reinforcement and built in elements.Project	SM GOST 5781-82
Water-repellent(silane and/or siloxane)	EN 1504-2
Sealing with 20% organic polymer binder	EN 1504-2
Concrete Paint	EN 1504-2
Hydraulic injection with cement paste of ultra fine cement binder	EN 1504-5

Polymric injection materials(epoxy, polyurethane and acrylic binders)	VSN 24-88, EN 1504-5
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417.03. Equipment

The following items of equipment and special auxiliary installation are likely to be needed:

- Autocrane for assembly and dismantling of the auxiliary installation;
- Compressor for pneumatic hammer, cleaning /drying cracks;
- Concrete pumping equipment;
- Deep vibrator for concrete compaction;
- Injection concrete equipment , metallic brush or sandblasting equipment for the concrete and reinforcement steel cleaning;
- Temporary scaffoldings, auxiliary piers, lifting equipment for repair works.

417.04. Repair Works

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. A drainage slope with a gradient of 1% will be executed with sand cement mortar on the collar beam and on the abutment, according to SNiP 3.06.04-91. The jointing of deck elements and the consolidation of pier piles will be executed with reinforced concrete after abrading and cleaning concrete and reinforcing bars according to the Project, VSN 24-88 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 in accordance with VSN 24-88, 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.

Remove honeycomb and other defected concrete down to sound concrete. Saw-cut the edges perpendicular to the surface or slightly undercut. Feather edges will not be permitted. Dampen the area to be patched, and an area at least 150 mm wide surrounding it, to prevent absorption of water from the patching mortar.

Where rock pockets or similar defect or voids expose steel reinforcement, cut-out to solid surface behind the reinforcement to provide a suitable key-lock for patching mortar. Patching mortar shall envelope the exposed reinforcement bar.

Bond patching mortar to concrete with bonding grout or epoxy adhesive. Bonding grout shall consist of 1 part Portland cement to 1 part No. 30 mesh sand, mixed to the consistency of a thick cream, and then well brushed onto the concrete. Bond commercial patching mortar to concrete in accordance with manufacturers instructions.

Make patching mortar of the same materials and of approximately the same proportions as used for the concrete, except omit coarse aggregate. Use not more than 1 part of portland cement to 2.5 parts sand by damp volume, and substitute white Portland cement for a portion of the regular grey Portland cement to produce patching mix matching the surrounding concrete when dry. Determine the proportion of white Portland cement by trial mixes.

After the surface water has evaporated from the area to be patched, brush the bond coat well into the surface. When the bond coat begins to lose its sheen, apply the patching mortar. Compact the mortar into place and strike off so as to leave the patch slightly higher than the surrounding surface. To permit shrinkage, leave the patch undisturbed for at least 1 hour before being final finished. Keep the patch area damp for 7 days.

Neatly finish patched surfaces to match adjacent surrounding surface texture of concrete. Grind or fill surfaces to produce level and plumb true planes.

For surfaces exposed to the finishing work, form tie-holes shall be patched and finished flush with the adjacent surface. For holes passing entirely through the walls, a plunger type injection gun or similar device shall be used to completely fill the hole.

Patching of honeycombed areas or rock pockets that are too large and unsatisfactory for mortar patching shall be cut-out to solid surface, keyed and packed solid with matching concrete to produce firm bond and flush surface. Patching shall match texture of adjacent surfaces where exposed in the finishing work.

Repair work in exposed locations that do not match the texture and colour of surrounding adjacent surfaces or that is not well performed, shall be removed and performed again until the repair work conforms with this specifications requirements.

Surfaces to receive membrane waterproofing shall have fins, burrs and loose material removed, and voids and cracks patched flush with adjacent surfaces.

The completed repairs shall be properly cured for 10 days using waterproof sheet materials, dump burlap or curing compounds. Curing compounds shall however not be used on surfaces when their use may be detrimental to bonding of concrete, mortar, membrane waterproofing, caulking and sealants, adhesives, plaster, paint or the specified surface finish or coating.

Cleaning and protection of reinforcement

Cleaned reinforcement should fulfill the following requirements:

- Rust, mortar, concrete, dust and other loose particles that may reduce the bond between Reinforcement and the repair material to be applied should be removed.
- The whole circumference of the reinforcement should be uniformly cleaned. However, this does not apply to electrochemical methods.
- Unless cleaning of reinforcement is made directly before application of repair materials, the cleaned area of substrate and reinforcement should be protected from additional pollution.
- Cleaning of reinforcement should be made without impairing the reinforcement and the substrate or the ambient concrete and environment.
- When reinforcement is polluted by chlorine or other substances leading to corrosion, the entire circumference of the reinforcement should be cleaned by low-pressure flushing so that chlorides and other substances are moved. However, this does not apply to electrochemical methods.
- When surface protection of reinforcement is necessary with 'coating with active pigments', the reinforcement should be cleaned and the degree of

cleaning should be in accordance with the work specification for the project.

Surface protection of reinforcement should be applied to the entire exposed surface. The surface protection agent should not pollute the substrate if it impairs the adhesive bond between substrate and repair.

417.05. Cleaning and filling of cracks

Cracks will be cleaned and dried using water jets and blowing equipment. The cracks will be filled according to VSN 24-88.

Filling of cracks, defects and interstices by injection can be performed by compression, gravitation or vacuum. The allowable temperature range for the substrate should be observed (only injection at temperatures above zero). Prior to injection, impurities in cracks, defects and interstices should be removed if possible (e.g. by water or air). Aggressive liquids such as hydrochloric acid, HCl, should not be used for cleaning. The permissible moisture content in cracks, defects and cavities to be injected depends on the injection material. However, it is possible to inject against water pressure with special injection materials. Cracks from corrosion on reinforcement due to chloride attack should not be injected before concrete with chloride content above the threshold value has been removed or the chloride content has been reduced, e.g. by electrochemical chloride extraction.

417.06. 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.

417.07. Work acceptance

Works acceptance will be in accordance with Chapter 1 and Sub-Clauses 002.02 and 002.04, provided they are executed in compliance with SNiP 3.06.04-91, Project, with this 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:

No.	Item	Unit of Measure
41701	Cleaning of visible concrete surface of exist. Sub- and superstructure (removal of dust, loose concrete and mortar particles). Method according to contractor.	Square meter
41702	Cleaning of visible reinforcement (removal of rust) approval by the engineer. Method according to contractor.	Linear meter
41703	Coating of visible reinforcement using anti-rust emulsion.	Linear meter
41704	Cleaning and filling of cracks using liquid suspension of cement with polymers, approval by the engineer.	Linear meter
41705	Priming of the visible surfaces of the substructure and superstructure concrete elements using epoxy suspension.	Square meter
41706	Patching of the sub- and superstructure surfaces using concrete with polymers. As required with steel mats.	Square meter
41707	Visible concrete surfaces of existing sub- and superstructure plaster using epoxy mortar. As required with steel mats.	Square meter
41708	Coating of the visible surfaces of the sub- and superstructure elements using liquid suspension of cement with polymers.	Square meter
41709	Repair of stone brickwork, vertical wall, approval by the engineer. Defective condition of the grooves between stones improve using zement mortar. If necessary, replacement of stones. Including all ancillary works and materials.	Square meter
41710	Repair of stone brickwork, arched-wall of arch bridge, approval by the engineer. Defective condition of the grooves between stones improve using zement mortar. If necessary, replacement of stones. Including all ancillary works and materials.	Square meter
41711	Jacket of the substructure elements using reinforced concrete	Square meter
41712	Coating of the visible surfaces of the substructure and superstructure elements using Sikagard® series materials or approved equal.	Square meter

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 SNiP 2.05.03-84, 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:

No.	Item	Unit of Measure
50101	Removal of Culvert Inlet or Outlet	Number
50101.1	Removal of culvert drop	Cubic Metre
50102	Removal of existing culvert barrel	Linear Metre
50103	Construction of culvert inlets and outlets to pipe culverts (pipe diameter to be stated)	Number
50104	Construction of culvert inlets and outlets to box culverts (state size)	Number
50105	Construction of new pipe culverts (pipe diameter to be stated)	Linear Metre
50106	Construction of new box culverts (box size to be stated)	Linear Metre

50107	Extension of pipe culverts (pipe diameter to be stated)	Linear Metre
50108	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 (600 mm dia) at side roads	Linear Metre

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:

No.	Item	Unit of Measure
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/mm² 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	Construction of spillway on embankment slope made of precast concrete units	Linear Metre
50302.1	Lined side drain or waterway Type 1 with precast concrete units or cast in situ	Linear Metre
50302.2	Lined side drain or waterway Type 2 with precast concrete units or cast in situ	Linear Metre
50302.3	Lined side drain or waterway Type 3 with precast concrete units or cast in situ	Linear Metre
50302.4	New construction of Lined side drain Type 4 with precast concrete units and/or concrete cast in situ rectangular 0.60 x 0.45.	Linear Metre
50303	Construct chute entry gulley, double sided	Number
50304	Concrete shoulder spillway one side discharge	Number
50305	Construct erosion basin to lined side drain or waterway	Number
50306	Construct erosion basin to embankment chute or waterway	Number
50307	Crushed stone stabilization of ditches	Linear Metre

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:

No.	Item	Unit of Measure
50401	Miscellaneous minor concrete structures	Cubic Metre
50402	Outlet dissipater, Concrete B 20, box culvert	Cubic Metre
50403	Pedestrian bridges	Number
50404	Precast RC slab 300x100x20cm	Number
50405	Cast-in-place RC bearing beam	Number
50406	Cast-in-place B 20 concrete base of thickness 20cm	Square Metre
50407	Precast RC slab 300 x100x10cm	Number

CHAPTER 505. OPEN DRAINS, SIDE DRAINS

505.01. Introduction

Open V-drains, side drains, mitre drains, cut-off drains, catch water drains, culvert outfall drains and earth drains, wherever applicable, shall be formed at the location and to the lines and levels shown on the drawings or as instructed by the Engineer.

Where shown on the drawings or instructed by the Engineer, the Contractor shall construct earth dams on side drains, cut-off drains, catch water drains, mitre and outfall drains to prevent the flow overshooting the drainage works or to direct flows into culvert inlets. Similar earth structures may also be used as erosion checks. Earth dams shall be formed in selected fill material compacted to a minimum dry density of 90 % MDD (AASHTO T180):

505.02. Side Drains and Drainage Ditches (V - drains)

In the course of construction side drains and drainage ditches have to be rearranged temporary or permanently over different length's depending local situation in relation to the embankment of the future motorway and the guidance of drains through the embankment.

The works required in this context are summarized in the following works, but necessarily but not limited or not all of them will be required:

- excavation for side drains and drainage ditches

- disposal of excess material
- cleaning for side drains and drainage ditches
- filling and compaction of side drains and drainage ditches and
- dewatering of side drains and drainage ditches.

Filling and compaction includes the provision of material and for compaction at least 92% MDD according to Aashto T180 is required. Compacted layer thickness should not exceed 20 cm.

Measurement

Side drains and drainage ditches shall be measured as per running metre.

Open lined Drains in Built Up Areas (U - drains)

Open channels (U-drains without removable covers), located along the sidewalks, will to be constructed where walkways are to be constructed.

Surface water will be conveyed to the nearest open water course or discharged into the existing drainage system at culvert locations (ref drawings).

The U-drains shall be made of concrete C 20/25, constructed on a layer of lean concrete C 12/15.

Measurement

Open U-drain shall be measured as per running metre.

505.03. Closed lined Drains in Built Up Areas (U - drains)

Closed channels (U-drains with removable covers), located along the sidewalks, will to be constructed where walkways are to be constructed.

Surface water will be conveyed to the nearest open water course or discharged into the existing drainage system at culvert locations (ref drawings).

The U-drains shall be made of concrete C 20/25, constructed on a layer of lean concrete C 12/15.

Measurement

Closed U-drain shall be measured as per running metre.

505.04. Subsurface Drainage

Parallel to the U-drains a subsurface drainage shall be installed.

The subsurface drainage consists of a permeable granular drain 50x50 cm, wrapped into geotextile as shown on the drawings.

The permeable natural material shall be clean, hard and durable with a minimum proportion of fines and shall comply with the following grading requirements:

Sieve Size	% Passing
40 mm	100
30 mm	90 - 100
20 mm	65 - 90
10mm	40 - 85

5mm	30 - 80
2mm	15 - 75
1 mm	12 - 60
0.5 mm	10 - 45
0.065 mm	0 - 10

Measurement

Payment as per running metre incl. excavation and disposal of excess material, geotextile and permeable granular filling.

Concrete Side Drain on top of Embankments

Concrete drainage elements, concrete side drains, made of concrete C20/25 (or 30/37) to be installed on top of embankment where the embankment has a height of 3.00 m or more and a horizontal slope of more than 2%.

Where appropriate, type, sizes and measures are shown in the drawings.

Measurement

concrete drainage elements shall be measured as per running metre.

Payment

No.	Item	Unit of Measure
50501	Cut V-drains parallel to the road embankment including disposal of the excess material into the deposit of the contractor	Linear Metre
50502	Closed concrete channel as per drawing	Linear Metre
50503	Open concrete channel as per drawing	Linear Metre
50504	Rectangular reinforced manholes including all pipe connections to existing ditches etc.as instructed by the supervision engineer	Number
50505	Granular subsurface drainage	Linear Metre

CHAPTER 506. PROTECTION WORK

506.01. Introduction

Where shown on the Drawings or instructed by the Engineer the Contractor shall provide and place protection works against erosion.

Protection works in connection with drainage channels, culvert inlets and outlets and river training will consist generally of stone pitching, riprap or gabions/matresses.

506.02. Stone Pitching (grouted)

The area to be pitched shall be neatly trimmed to line and level and compacted.

The stones (with a minimum dimension of 150 mm) shall be thoroughly cleaned of adhering dirt or clay, moistened.

The stone pitching shall be of stones, which shall be laid in a concrete bed (C12/15) of 75mm, while the concrete is still fresh.

Openings between stones and any spaces between the stones shall be filled with cement mortar or grout (composed both of one part of cement to six parts of sand) as and care shall be taken not to spill the mortar onto the finally exposed surfaces of the stones. Grout spilt onto the exposed surface of the stone shall be removed while still soft and the joints between stones shall be neatly finished.

The mortar and the grout shall be placed in a continuous operation for any days run at any one location. The grout shall be worked into the pitching to ensure that all spaces or voids between the stones will be completely filled with grout to the full depth of the stone pitching. Grout spilt onto exposed surface of the stone shall be removed while still soft, and the joints between stones shall be neatly finished.

The grouted pitching shall be cured with wet sacking or other approved wet cover for a period of not less than four days after grouting, and shall not be subjected to loading until adequate strength has been developed.

Where required, weep holes shall be formed in the pitching.

Measurement

Stone pitching shall be measured as per m² net. No extra allowance will be made for facing, sills, sloping, battering, curved works etc.

506.03. Riprap

Riprap shall consist of a course of packed large stones, boulders or lumps of rock placed on bank slopes and outlets toes in stream and river beds and at other localities where protection of this type may be required.

Depending on the slope and the expected stream, the size of stones/boulders is varying:

stones D50 ≤ 350mm
stones 350mm < D50 < 1000mm
stones 1000mm < D50 < 1500mm

The surface of areas to receive riprap shall be neatly trimmed to line and level and all loose material compacted.

Measurement

Riprap shall be measured as per m².

Payment

No.	Item	Unit of Measure
	Stone Pitching (grouted)	
50601	Provide and place stones in mortar, fill spaces/voids with grout	Square Metre

50602	Rip-rap on culvert in- and outlets with stones D50 ≤ 350mm	Square Metre
50602A	Rip-rap on culvert in- and outlets with stones 350mm < D50 < 1000mm	Square Metre
50602B	Rip-rap on culvert in- and outlets with stones 1000mm < D50 < 1500mm	Square Metre

CHAPTER 507. Gabions and and Mattresses

507.01. Introduction

Gabions shall be type 'Maccaferri' boxes and/or 'Reno' mattresses, or similar, both with diaphragms at 1 metre centres, or similar approved. The maximum mesh size shall be 100 mm x 120 mm for boxes and 60 mm x 80 mm for mattresses. The wire used for the construction of gabions shall be either of appropriate hard plastic material or plastic coated and unless otherwise instructed by the Engineer and comply with the requirements shown below

Wire for Gabion/Matress Construction

Description		Diameter (mm)	Galvanising (g/m ²)
Mesh	Box	3.4	275
	Mattress	2.7	260
Binder	Box	2.2	240
	Mattress	2.2	240
Selvedge	Box	3.9	290
	Mattress	3.4	275

The alignment of the gabion shall be correct within a tolerance of 100 mm of the instructed alignment and the level of any course of gabion shall be correct to within a tolerance of 50 mm of the instructed level. In addition adjacent gabions shall not vary by more than 25 mm in line and/or level from each other.

The pre-packed elements of gabions shall be of dimension 2.00 x 1.00 x 0.50 m and arranged as shown on the standard drawings.

The surface upon which gabions are to be laid shall be compacted to a minimum dry density of 90 % MDD (AASHTO T180) and trimmed to the instructed level or shape.

Joints in gabions shall be stitched together with 600 mm minimum lengths of binder wire, with at least one stitch per 50 mm, and each end of the wire shall be fixed with at least two turns upon itself.

Adjacent gabions shall be stitched together with binder wire along all touching edges.

Gabion boxes shall be laid with broken bond and throughout to avoid continuous joints both horizontally and vertically.

All wire shall be to BS 1052 having a tensile strength of not less than 40 kg/mm² and plastic coated or appropriate plastic material produced by a reputable manufacturer, subject to the approval of the Engineer.

Galvanising shall comply with the requirements of BS 443.

Gabions shall be constructed to the shapes and dimensions as shown on the Drawings or given in the Special Specification or as directed by the Engineer. Gabions, as constructed shall be within a tolerance of $\pm 5\%$ on the height or width instructed and $\pm 3\%$ on the length instructed.

Gabions shall be hand-packed with broken rock of 150 mm minimum dimensions and 300 mm maximum dimension. The sides shall be packed first in the form of a wall, using the largest pieces, with the majority placed as headers with broken joints to present a neat outside face. The interior of the gabion shall be hand packed with smaller pieces and the top layers shall be finished off with larger pieces. The whole interior and top layers shall be packed tight and hammered into place.

Where shown on the drawings or where instructed by the Engineer the Contractor shall place filter fabric ('Terram' or similar approved) behind gabion faces or below mattresses in contact with existing or backfilled ground. The Contractor shall ensure that the filter fabric is not damaged during the construction or backfilling around the gabion works and any damaged or torn fabric shall be replaced.

At the back face and ends of completed gabion work or where shown on the Drawings or instructed by the Engineer the existing soil shall be backfilled, thoroughly compacted against the sides of the gabions and finished flush with the top surface of the gabion.

507.02. Gabions

General: handling, fixing filling and fastening according to manufacturers instructions. On earth touched sides a geotextile membrane shall be fixed onto the gabions. Gabions shall be filled as instructed and with stones of appropriate size.

Measurement

Gabions shall be measured as per m³.

507.03. Mattresses

General: handling, fixing filling and fastening according to manufacturers instructions. On earth touched sides a geotextile membrane shall be fixed onto the gabions. Mattresses shall be filled with stones of appropriate size.

Measurement

Mattresses shall be measured as per m².

507.04. Geotextile (filter fabric)

Separation membrane material shall be a polypropylene or polypropylene/ polyethylene mixture geotextile and shall be obtained from manufacturers with proven quality control procedures. The Contractor shall provide evidence that the material proposed will be sufficiently durable, when installed, to maintain its integrity for at least 30 years.

1) The geotextile shall sustain a tensile load of not less than 7 KN/m when determined in a "wide Strip" tensile test carried out in accordance with BS 6906: Part 1. The characteristic strength shall be taken as the value of the strength of the material below which not more than 5% of test results may be expected to fail.

2) The permeability when tested in accordance with BS 6906: Part 3 shall not be less than 10 litres per m² per second, in either direction when tested under constant head of 100 mm.

- 3) The geotextile shall have a pore size distribution such that the mean 090 is between 100 and 300 microns when tested in accordance with BS 6906:Part 2.
- 4) The mean peak strength puncture resistance when tested in accordance with BS 6906: Part 4 shall be less than 1500 N.
- 5) The minimum tear resistance when tested in accordance with ASTM D4533-85 shall not be less than 300 N.

Measurement

Geotextile shall be measured as per m².

507.05. Cleaning and Maintenance

The Contractor shall be responsible for maintaining all drainage structures, culverts, channels and drains free of silt and other deposited material until the end of the contract, including the Defects Liability Period or its equivalent and shall repair any damage to the Works caused by his failure to maintain the drainage system.

Payment

No.	Item	Unit of Measure
	Gabions Location and Quantity to be determined by the Engineer.	
50702	Excavation for gabions	Cubic Metre
50702A	Provision and placing of Gabions, double twist hexagonal 3.0mm wire mesh, all sizes, including unfolding, lacing, bracing	Cubic Metre
50702B	Provision of Rockfill material, filling and packing, faces with selected material	Cubic Metre
	Mattresses Location and Quantity to be determined by the Engineer.	
50703	Excavation and surface preparation for bedding of mattresses	Square Metre
50703A	Delivery and placing of mattresses (incl unfolding and lacing)	Cubic Metre
50703B	Provision of Rockfill material, filling and packing with selected material	Cubic Metre
	Geotextile (filter fabric)	
50704	Provide and install Geotextile (continuous polyester filament double needle-punched, min 500gr/m ²), incl cutting, placing and fixing.	Square Metre

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/mm² 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/mm² 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 – type 1	Linear Metre
50802	Precast concrete kerbing – type 2	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/m²/sec, and a minimum thickness of 0.9mm and a minimum density of 100 gm /m². 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 widened and deepened 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 painted 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

No.	Item	Unit of Measure
50901	Construction of transversal drains	Linear Metre
50902	Construction of the filter drain	Linear meter
50903	Construction of the manhole	Linear meter
50904	Construction of the exit gully	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:

No.	Item	Unit of Measure
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60101	Install new galvanised steel guardrail, type 11 DOMJ	Linear Metre
60102	Re-install existing steel W beam guardrail without refurbishment	Linear Metre
60103	Refurbish and re-install existing steel W beam guardrail	Linear Metre
60104	Provide new post for re-set guardrail	Number

CHAPTER 602. Crash Barriers

602.01. New Jersey Barriers

New Jersey Barriers shall be provided and installed on bridges and roads made of reinforced concrete class C20/25 (or C30/37), quality requirements as per chapter 400 "Bridges and Structural Concrete".

602.02. Metallic Crash Barriers

Crash Barriers shall be provided and installed in the road-shoulders before/after bridges, directly adjacent to the New Jersey barriers on bridges, on dangerous sections with steep slope and in narrow curves and equipped with reflectors.

Crash barriers ends to be bent back to an angle of 1:20, and to be brought down in the ground at end of a section of 15 m (ref. to drawings).

Vehicular guardrails shall meet the requirements on EN 1317-2, DIN 17100 or AASHTO. Guardrail beams shall be corrugated section, and guardrail posts and blockouts between guardrail beams and posts shall be steel channel section conforming to the above standard.

All connections, including connecting plates, bolts, nuts and washers shall conform to the above standard.

The posts for on-bridge vehicular guardrails shall be welded to a steel base plate formed from material complying with AASHTO M270. Welding shall be in accordance with the requirements of ANSI/AASHTO/ANS D 1.5. The welded connection shall be capable of developing a moment of resistance equal to the ultimate moment capacity of the post.

Fixing bolts for guardrails shall be supplied complete with nuts and washers. Holding down bolts shall be steel anchor bolts conforming to AASHTO M314. Nuts shall be in accordance with AASHTO M291. Washers shall be in accordance with AASHTO M293.

All steel components, including all bolts, nuts and washers, shall be hot-galvanised or painted in accordance with one of the systems specified in this specification.

Measurement and Payment

The unit rates entered into the Bill of Quantity for guard-rails shall be inclusive of the necessary installation works, driving of posts, concrete, etc. Where bolting of guard-rails on structures becomes necessary, rates stated in the Bill of Quantity shall be inclusive all necessary works including welding, ancillary materials, coating, sealing.

No.	Item	Unit of Measure
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	<u>Guard Rails (metallic and concrete)</u>	
60201	Provision and complete installation of metallic Guard Rails (crash barrier), hot galvanized , incl all ancillary works (earth and concrete works, metal works, etc.)	Linear Metre
60202	Provision and complete installation of doubled metallic guard rails (reinforced crash barrier), hot galvanized , incl all ancillary works (earth and concrete works, metal works, etc.) over selected culverts.	Linear Metre

CHAPTER 603. *Fences*

603.01. Wire Fences

Provision and erect a mesh wire fence (Coated with PVC) complete (2000mm height). The works comprise all ancillary works, as earthworks (for fence poles foundations), civil works (lean concrete for foundations), metal works (gates, width 6,0m), provision of all material and equipment.

Steel poles should at least be 50mm strong water pipes. After setting the poles should be filled with concrete mortar 1:3.

The fencing poles should be set into concrete foundation of 40 x 40 cm and depth of 1.00m.

All steel components, including all bolts, nuts and washers, shall be galvanised.

603.02. Security Fence on Bridges (prevention of railway overhead line contact)

The security fence shall prevent contacting the electrified railway overhead lines, made of acrylic glass, 2 cm thick, fully encircled by a metal frame, and fixed on steel sections HEA 120 anchored onto the sidewalk cap of bridges over electrified railway lines.

Quality requirements of welding and anchoring according to the requirements of "Railing / Pedestrian Handrails" above.

CHAPTER 604. *ReTAINING WALL*

604.01. Introduction

The works under this chapter include: construction of the retaining walls made of reinforced concrete cast in-situ, and the provision of drainage material and/or pipe drains behind such walls or other structures.

604.02. Materials

- Concrete for the walls shall be according to GOST 26633-85
- Reinforcement shall comply with GOST 5781-82 and

- Reinforcing mesh shall comply with GOST 23279-85
- Filter surround materials for the drain - GOST 8267-93.

604.03. 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 GOST 14098-95. Welding of reinforcement shall be avoided wherever possible and shall not be carried out without the explicit permission of the Engineer.

604.04. 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, 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.

604.05. General conditions.

Concrete for the wall will be placed in lifts no higher than 1,5m.

Walls will be provided with expansion joints where directed or instructed by the Engineer. The expansion joints will be made of soft wood boards treated with preservatives.

The drainage surround will be made of crushed granite gravels and shall conform to the outlines shown on the Drawings.

Walls and drains shall be constructed in conformity with the Drawings.

604.06. Acceptance of work

The works will be accepted under the terms of chapter 002 providing that they have been constructed entirely in conformance to the plans and specifications pertaining to the segment involved and are approved by the Engineer.

Measurement

Wall construction shall be measured in cubic metres of concrete. The measurement thus made shall cover the whole of the works involved in constructing the walls including any necessary structural excavation for construction clearance, concrete, formwork, reinforcement, expansion joints, curing and all other associated works.

Provision of the drainage material behind the walls including all materials shall be measured in linear metres of drain instructed or actually installed whichever is the less. Where pipe drains are required behind walls or other structures they shall be measured in linear metres of drain instructed or actually installed whichever is the less.

The measurement of drainage shall include for all works of whatsoever nature required to install the drainage material and/or pipe complete as shown in the drawings or instructed by the Engineer.

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
60401	Construct retaining wall in reinforced concrete.	Cubic Metre
60402	Gravel drain behind structures	Linear Metre
60403	Pipe drain behind structures	Linear Metre

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:

No.	Item	Unit of Measure
70101	Install new signs on metallic gantry frame	Number
70102	Install new signs on existing supports	Number
70103	Install new marker posts	Number
70104	Install new kilometer posts	Number
70105	Install new signs on new supports, including installation of posts	Number
70106	Install new Direction signs on new supports, including installation of posts	Number
70107	Traffic light	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 180⁰ C and 200⁰ 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/m², 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/m² on asphalt concrete and 6 kg/m² 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	Double line (centre line) passed through, width 0.1 m, white	Linear Metre
70202	Full line (centre line, shoulders) passed through, width 0.1 m, white or yellow	Linear Metre
70203	Broken line (centre line, shoulders), width 0.1 m, ratio 3:1, white or yellow	Linear Metre
70204	Arrows, letters, etc.	Number
70205	Various areas, white or yellow color (arrows, zebra crossings, traffic islands, letters, etc.)	Square Metre

70206	Give way triangles (shark teeth)	Number
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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.

No.	Item	Unit of Measure
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. REARRANGEMENT OF POWER LINES. ROAD ILLUMINATION

801.01. Introduction

The chapter concerns, the rearrangement of aerial power lines of 10kV, the rearrangement of aerial power lines on the same hanger of 10rV and 0.4 KV, arrangement of external lightning.

The Contractor is fully responsible for the collaboration with any other organizations which are situated within the limits of the deviation line.

801.02. Materials

The materials used for protection or deviation of the installations belonging to one of the organizations must correspond to the existing installations agreed by the representative of the given organization.

801.03. Working conditions

Before starting the work the Contractor must notify the organizations owning the installations about the area of the site and to ask them to mark the position of any installation in the construction area.

The Contractor is fully responsible for any deterioration of the installation during the construction period and he must repair it. Also if the owner organization requires, the Contractor shall make available machines or/and the staff needed for the reparation of deteriorated installation, at the same time paying the whole cost of the work.

If within the limits of the construction site exist networks, the Contractor shall submit to the Engineer a proposal, regarding the transfer of these networks outside the site. The proposal must contain the due date, plans and details of the transfer on the new location, details of all materials to be used and the necessary certificates proving the compliance of the quality of materials with the certifications and drawings of networks owners, regarding the protective devices and the quality of materials, which will be used. After the network placing on the new location the network owner must inspect the works before backfill.

Directed by the Engineer, the Contractor takes the necessary measures to protect the installation against frost. The service trenches and the backfill must be done in accordance with Chapter 203.

Measurements

The rearrangement of aerial power lines of 10kV and 0,4kV, is measured in number of foots and in linear meters. The arrangement of external lightning is measured in number of lights.

Payment

Accepted work volumes are remunerated by unitary job prices of the Contract. The payment represents the full amount of remuneration for works, described in this chapter. The payment is made according to following items.

No.	Item	Unit of Measure
80101	The rearrangement of aerial power lines of 0.4kV with light	Number of Poles
80102	The rearrangement of aerial power lines of 10kV	Number of Poles
80102A	The rearrangement of subterranean cable power lines of 10kV	Linear Metre
80103	The rearrangement of aerial power lines of 110kV	Number of Poles /Linear Metre
80104	Arrangement of external lightning	Number of Poles /Linear Metre
80105	Installation of new Substation	Number

CHAPTER 802. REARRANGEMENT OF COMMUNICATION LINES**802.01. Introduction**

The chapter concerns, the rearrangement of aerial communication lines, the rearrangement of underground communication lines, protection of underground communication lines. The Contractor is fully responsible for the collaboration with any other organizations, which are situated within the limits of the deviation line.

802.02. Materials

The materials used for repair or deviation of the installations belonging to one of the organizations must correspond to the existing installations agreed by the representative of the given organization.

802.03. Working conditions

Before starting the work the Contractor must notify the organizations owning the installations about the area of the site and to ask them to mark the position of any

installation in the construction area.

The Contractor is fully responsible for any deterioration of the installation during the construction period and he must repair it. Also if the owner organization requires, the Contractor shall make available machines or/and the staff needed for the reparation of deteriorated installation, at the same time paying the whole cost of the work.

If within the limits of the construction site exist networks, the Contractor shall submit to the Engineer a proposal, regarding the transfer of these networks outside the site. The proposal must contain the due date, plans and details of the transfer on the new location, details of all materials to be used and the necessary certificates proving the compliance of the quality of materials with the certifications and drawings of networks owners, regarding the protective devices and the quality of materials, which will be used. After the network placing on the new location the network owner must inspect the works before backfill.

Directed by the Engineer, the Contractor takes the necessary measures to protect the installation against frost.

The service trenches and the backfill must be done in accordance with Chapter 203.

Payment

No.	Item	Unit of Measure
80201	Rearangement of underground communication cable	Linear Metre
80201A	Rearangement of underground communication optic cable	Linear Metre
80202	Rearangement of underground water supply	Linear Metre
80203	Rearangement of underground gas pipeline	Linear Metre
80204	The rearrangement of aerial communication lines	Linear Metre

CHAPTER 803. Bus Stops

Existing Bus Stops shall be replaced/ rehabilitated at the same location.

Bus stops, incl. shelter shall be constructed according to the relevant drawings and/or as instructed by the Engineer.

No.	Item	Unit of Measure
80301	Construction of complete shelter for bus stop as shown on drawings, including all ancillary work	Number

CHAPTER 804. *Crossing of Railway Lines*

“Crossing” means any railway crossing of a road at grade or any road crossing of a railway at grade, but does not include road or railway approaches to a crossing surface.

No works shall be done in the vicinity of railway lines without involvement of the - Railway Department Moldova / Chisinau - .

Work performed on the railway right-of-way shall be performed without interfering with the movement of trains. The Contractor shall prevent accidents, damage, or unnecessary delay or interference with the railway trains or other property.

The Contractor is responsible for arranging liaison with the Azerbaijan State Railway and obtaining all required approvals and permits. The works shall be executed either by the - Railway Department Moldova / Chisinau - . or by a contractor appointed by the - Railway Department Moldova / Chisinau - .

Before the start of any work in the railway right-of-way respective technical details shall be clarified by the Contractor with the - Railway Department Moldova / Chisinau - and the respective agreed details of the railway crossing work has to be submitted to the Engineer for approval.

Unless otherwise ordered by the - Railway Department Moldova / Chisinau - , when a crossing is constructed, the crossing surface shall have a width of the width of the carriageway and shoulders, sidewalks plus 0.5 m on each side of the carriageway and shoulders, sidewalks, as measured at the approaches to the crossing, whichever is the greater.

The crossing pad shall be constructed of such material as the - Railway Department Moldova / Chisinau - may require and compatible with the current international state-of-the-art practices.

Roadway markings and signing shall be provided at the crossing in accordance with the relevant standards and regulations in Moldova.

Railroad signage at crossings shall be provided in accordance with the requirements of the - Railway Department Moldova / Chisinau - .

CHAPTER 805. *Animal Crossings*

Underpasses “Animal Crossings”, reinforced concrete structures (width= 4.00m, height= 2.50m), requirements and construction as box culverts, to be constructed to allow animals to underpass roads.

9. 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	Cubic meter

	used in counterberms and miscellaneous embankment works	
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 ² s (mm/s)	90 maximum
Characteristic opening O ₉₀	[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 ² s (mm/s)	55 maximum
Opening size O ₉₀	[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 ²	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 ² /s	4.0 / 1.1
Permeability normal to the plane	[EN ISO 11058 - Δh = 50 mm]	l/m ² s (mm/s)	60 maximum
Opening size O ₉₀	[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

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 ²	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 ²	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 PolymatMattress 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	Geocomposite Type 1 (SAMI)	Square meter
90202	Geotextile Type 2 (separating and filter membrane for protection)	Square meter
90203	Geotextile Type 2 (filter protective membrane)	Square meter
90204	Geocells (Shoulder reinforcement)	Square meter
90205	Polumat Mattress (Shoulder reinforcement)	Square meter

CHAPTER 903. ACCESS ROADS

903.01. Introduction

The works in this chapter cover the construction of the temporary roadways for access to slip areas

903.02. Materials

Materials shall be at the Contractor's option.

903.03. General Conditions

The Contractor shall make his own arrangements for necessary access to slip areas. He shall construct such road ways and hard standings as he considers fit for the movement and operation of his vehicles and equipment. He shall be solely responsible for locating and acquiring/easing the required areas of land for such accesses. Before undertaking construction of such accesses he shall prepare carefully surveyed plans and submit them to the Engineer for his approval. He shall demonstrate to the satisfaction of the Engineer that the requirements of all owners and tenants of land affected by his proposed accesses are satisfied with the arrangements made and that there are no objections from any quarter, including the local authorities, to his plans.

When the accesses are no longer required, the Contractor shall completely remove all traces of the accesses and of his presence and shall restore the land to its original condition. The only exception to this requirement shall be where affected land owner(s) require the access (es) to be left in place and where it can be clearly shown that the approval of the local authorities to such retention of the access (es) has been granted.

903.04. Acceptance of Works

The roads are for the sole convenience of the Contractor. No formal acceptance is required until the accesses are to be removed. Acceptance of removal will only be given when the Engineer is satisfied that all traces of the accesses have been obliterated and the site(s) of such accesses have been fully restored to their original condition or that they have been formally and officially handed over to a third party with legal right to take them over and with the approval of the relevant local authorities.

No taking over certificate will be issued until the access roads have been satisfactorily removed or until they have been handed over and formally accepted in the eventuality that they are to remain.

Measurement

The provision of access road(s) at the site of slip remedial works shall not be measured as they are not required in our case.

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 this item 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:

No.	Item	Unit of Measure
90301	Provide and remove access for slip remedial works	Lump Sum

Payment of the lump sum for provision of access road(s) shall be made in two parts. 60% of the sum shall be paid when the Engineer is satisfied that the Contractor has completed construction of the approved access roads to the approved standard. The remaining 40% shall be paid on completion of the remedial works and when the Engineer is satisfied that the Contractor has discharged all his obligations in respect of their removal or handover under the Contract.

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 $\varnothing 0.80\text{m}$	Linear meter
90402	Construction of Connecting beam	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 Ø120-200 - 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:

No.	Item	Unit of Measure
90501	Construction of filter subdrains	Linear meter
90502	Construction of the silt trap	Each
90503	Construction of manholes	Linear meter

CHAPTER 906.

RETAINING WALL

906.01. Introduction

The works under this chapter include: construction of the retaining walls made of reinforced concrete cast in-situ, and the provision of drainage material and/or subdrainage pipes behind such walls or other structures.

906.02. Materials

Concrete for the walls shall be according to GOST 26633-91*

Reinforcement shall comply with GOST 5781-82*

Reinforcing mesh shall comply with GOST 23279-85

Filter surround materials for the drain - GOST 8267-93*.

906.03. 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 Quality Certificate from the producer, demonstrating the compliance with the 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 with the Engineer. Before use, all reinforcement must be cleaned of rust, mud, dust and grease; joints of reinforcing bars are to be executed by overlapping and in compliance with requirements of the Technical Specification; the overlaps shall be equal at least to 30 bar diameters.

Where the welding of reinforcement and built-in elements is unavoidable, the work shall be executed in accordance with the requirements of GOST 14098-91. Welding of reinforcement

shall be avoided wherever possible and shall not be carried out without the explicit permission of the Engineer.

906.04. 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, 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 formworks 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.

906.05. General Conditions

Concrete for the wall will be placed in lifts no higher than 1.5m.

The walls will be performed with expansion joints where directed or instructed by the Engineer. The expansion joints will be made of soft wood boards treated with antiseptic compounds (preservatives).

The subdrainage shall be performed of crushed granite stone and an asbestos-cement pipe of a diameter as shown on the Drawings.

the walls and subdrains shall be constructed in compliance with the Drawings.

906.06. Acceptance of Works

The works shall be accepted under the terms of Chapter 002 provided they have been performed in compliance with the Drawings and Specifications pertaining to this scope of works and are approved by the Engineer.

Measurement

Wall construction shall be measured in cubic metres of concrete. The measurement thus made shall cover the whole works performed for construction of the walls including any necessary structural excavation for construction clearance, concrete works, formworks, reinforcement, expansion joints, curing and all other associated works.

Provision of the draining material behind the walls including all other materials shall be measured in linear metres of subdrains instructed or actually installed whichever is the less.

Where subdrainage pipes are required behind the walls or other structures they shall be measured in linear metres of subdrain instructed or actually installed whichever is the less.

The measurement of subdrainage shall include all kind of works required for installation of draining material and/or pipes as shown on the Drawings or instructed by the Engineer.

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 this chapter.

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

No.	Item	Unit of Measure
90601	Construction of reinforced concrete retaining structure	Cubic meter
90602	Draining gravel behind retaining structures	Linear meter
90603	Subdrainage pipe behind the retaining structures	Linear meter