



एन एच पी सी लिमिटेड  
(भारत सरकार का एक नवरत्न उद्यम)

**NHPC Limited**

(A Government of India Navratna Enterprise)

CIN: L40101HR1975GOI032564

Regd. Office: NHPC Office Complex, Sector-33, Faridabad-121003(Haryana)

Dated: 24.04.2026

Corrigendum -6

Name of the Work: - "Lot-2: Construction of Head Race tunnels including Intakes, Pressure Shafts, Penstocks, Power House Cavern, Transformer cum GIS Cavern, Draft Tube Gate Operation Chamber including Gate shafts, Downstream Surge Cavern, Tail Race Tunnels, Pothead Yard, Adits including approach roads of Kamala H.E. Project (1720MW), Kamle district, Arunachal Pradesh"

Tender ID.: 2025\_NHPC\_884444\_1

Sl. No	Clause No./ Ref.	Existing Bid Conditions/ Description	Amended Bid Conditions/Description
<b>VOLUME-4: Technical Specifications for Civil Works, Model QAP and Safety Manual</b>			
1.	TECHNICAL SPECIFICATION	<b>PART B</b> SECTION B.21- ROAD WORKS	Revised TECHNICAL SPECIFICATION <b>PART B</b> SECTION B.21 - ROAD WORKS is placed as <b>Annexure -1</b>

All other terms & conditions of the tender document shall remain unchanged.

General Manager (CC-I)

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## SECTION B.21 ROAD WORKS

### 21.1 SCOPE OF THE WORK

- 1) This Section covers all labour, materials, equipment and services required for the construction of temporary site roads, balance access roads, if any, up gradation of PWD roads including parking areas, and such other areas in the vicinity of structures as shown on the Drawings or as directed by the Engineer-in-Charge.
- 2) The access roads constructed by Employer will be handed over to the contractor on “as is where is” basis.
- 3) The Contractor shall be responsible for maintenance and repair of access roads and temporary site roads.
- 4) Maintenance will include good riding condition, maintenance of side drains, culverts, protection walls and clearance of slides as and when it occurs.
- 5) The roads constructed by the Contractor shall be designed and based on the tentative layout shown on the Tender Drawings and as described herein. The design shall be submitted to the Engineer-in-Charge for approval.
- 6) The construction of Access roads and temporary site roads shall include but not be limited to the following items:
  - a) Common excavation
  - b) Rock excavation
  - c) Backfill
  - d) Stone/masonry walls.
  - e) Gabions/ Wire crates
  - f) Concrete for culverts.
  - g) Construction of sub-base and base courses,
- 7) The Contractor shall establish adequate traffic and dust control measures and safety regulations on all site roads. Paved/ Unpaved roads shall be frequently sprayed with water during dry weather to prevent the formation of dust clouds. Site roads shall be well drained and graded to ensure a firm, non-sliding surface during the rains and in winter. If the contractor does not heed to the instructions in this regard, the Engineer-in-charge shall be at liberty to get the work done at the cost of contractor.

### 21.2 PRINCIPAL ACCESS ROAD TO THE SITE

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The Project is located in Kamle District of Arunachal Pradesh and lies at latitude & longitude 27° 46'18"N, 93°59'19"E. The Project dam is located at a distance of approx. 4 km upstream of the current suspension bridge across the Kamala River and newly constructed 70R bridge under Trans Arunachal Highway at Tamen. Tamen is located at distance of about 20 kilometers from Raga the district headquarter of Kamle district and 55 km from Ziro, the district headquarter of Lower Subansiri district. The Powerhouse site of Project is located approx. 500 meters downstream of the dam axis.

### 21.3 ACCESS ROADS WITHIN THE PROJECT AREA

All components of the Kamala HEP falls under Kamporijo/ Raga circle in Kamle Distt. on the right/ left bank of river Kamala, except the reservoir which stretches into Kamle district, Kra Daadi district and small portion tentatively falling in Kurung Kumey district. In order to reach to the Project Components on the left bank from Tamen bridge, a RWD road constructed under PMGSY Scheme is available. However, the condition of the road is deplorable. This road needs to be widened for movement of heavy equipments and machineries as well as the bridges/ culverts falling in this stretch is also required to be upgraded/ strengthened upto the quarry site at Duggi village.

Similarly, to reach the right bank of dam axis, a RWD road (constructed under PMGSY Scheme) from Trans Arunachal Highway takes off from Boasimla bridge over Pein river. The road is narrow having hair pin bends and goes upto Kamporijo village via CO Headquarter. This stretch of road also requires to be widened as well as the bridges/ culverts falling in this stretch is also required to be upgraded/ strengthened for construction purpose. Both the RWD roads (left and right bank) will be disconnected for public use due to involvement of dam stripping. The road realignment therefore, shall be taken up accordingly.

As all the Project components are in the close proximity to the existing RWD road, therefore, only approaches leading to Project components at various elevations have to be constructed. Further, the road leading to quarry/ dumping areas are also in the close proximity to the existing Trans Arunachal Highway/ existing RWD road.

Dam site and Diversion tunnels are located at distance of approximately 4km U/s of Tamen village. The left bank area u/s of Tamen bridge and around dam axis is exclusively available for dam facility works. A 70R bridge is available for immediate crossing of Kamala River for accessing the left bank of Dam site, while bridge of 24 R capacity is available for crossing the Pein Nallah to access the right bank area of Dam site. However, the present condition of 24 R bridge is not suitable to even cater to its own designed capacity due to its dilapidated condition. As such to cross over the pein river, a temporary bailey bridge needs to be constructed for immediate shipment of machineries and equipments till the time the new bridge of 70 R of (width 4.25m and span55m capacity100tonne) shall have to be constructed by the Contractor. (For Lot-1)

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A provision of 70 R composite bridge of span 90-100m has also been kept d/s of dam to cater to the transportation of the muck/quarry material etc. located on either of the banks for which Contractor after site assessment has to plan for the exact location of the bridge and design accordingly. (For Lot-1)

To fulfill Project criteria, a pucca black-topped road on the left side that is roughly 3.5 meters wide and runs from the current suspension Tamen bridge upstream to Kamporijo circle needs to be widened. The section u/s of the dam would be realigned along the reservoir perimeter since it would be submerged in the reservoir. Also, partial section of road on the right bank near dam top which will be acquired for construction and will go into submergence shall require to be realigned. (For Lot-1)

In the u/s of dam approx. 200m, a suspension bridge is presently available for movement of locals from left bank to right bank. The said bridge can also be utilized by the contractor after assessing the load condition and applying suitable strengthening measures for their movement between the two banks.

### 21.3.2 Access Roads to the Quarries / Borrow / Dumping Areas

In order to reach to the Quarries / Borrow / Dumping Areas on the left bank from Tamen bridge, a RWD road constructed under PMGSY Scheme is available. However, the condition of the road is deplorable. This road needs to be widened for movement of heavy equipments and machineries as well as the bridges/ culverts falling in this stretch is also required to be upgradaded/ strengthened upto the quarry site at Duggi village.

Similarly, to reach the Quarries / Borrow / Dumping Areas on right bank o, a RWD road (constructed under PMGSY Scheme) from Trans Arunachal Highway takes off from Boasimla bridge over Pein river. The road is narrow having hair pin bends and goes upto Kamporijo village via CO Headquarter. This stretch of road also requires to be widened as well as the bridges/ culverts falling in this stretch is also required to be upgradaded/ strengthened .

However Any temporary road to the desired pit/quarry, parking area etc., if required, will be constructed by the Contractor at his own cost.

### 21.3.3 Maintenance and Repair Work on Access Roads

- 1) The maintenance of access roads within the Project area to be carried out by the Contractor shall include, but not be limited to, the following work:
  - a) Immediate repair of all irregularities produced by traffic, water, snow or ice such as pot holes or other damage to the roadway surface,
  - b) Repair of any road-related structures damaged by traffic,
  - c) Periodical shaping and grading of the roadway wherever necessary to allow good surface drainage and to maintain it in optimal condition for traffic at all times,

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- d) Keeping the drainage structures and culverts etc. free of debris or any other material that may reduce their flow capacity,
  - e) Provide the necessary traffic signs and signals, and
  - f) Effective dust control by regular sweeping & cleaning and water sprinkling etc.
- 2) If there is damage to the protection works (retaining walls, gabions) and these are required to be rebuilt, the same shall be rebuilt at the orders of Engineer-in-Charge and shall be considered for payment as per relevant unit rates.
  - 3) Clearing of landslides on access roads within the project area shall include, but not limited to, the following works will be carried out by the Contractor.
    - a) Clearing of slides onto the roadway and lateral slopes, during and after rain/snow fall.
    - b) Disposal of materials removed by the above-mentioned operation to approved spoil areas.

### 21.4 TEMPORARY SITE ROADS

- 1) The Contractor shall select, design, construct and maintain all necessary temporary roads, parking areas and other access facilities within the Site required for the construction of Permanent and Temporary Works, including all borrow and quarry areas.
- 2) The roads shall be wide enough to allow heavyweight traffic in both directions. To prevent excessive erosion, no steeper longitudinal slope than 10% shall be used, except when specifically approved by the Engineer-in-Charge.
- 3) Except where rock is encountered, the back slopes of cut banks shall be stable and compatible with existing topography, and shall be flattened and rounded as far as practicable into natural ground surface.
- 4) The Contractor shall install suitable devices and drainage structures in sufficient numbers to prevent accumulation of excessive water and erosion of the road surface, drainage ditches, and excavated area.
- 5) The Engineer-in-Charge as well as other contractors and subcontractors working on the Project shall be permitted access, free of charge, to all site roads throughout the duration of the Contract.
- 6) Upon completion of the Works, these roads shall be handed Employer. Those site roads which Employer does not choose to keep shall be made impassable to vehicular traffic and the surfaces shall be scarified and left in a condition which will facilitate natural vegetation.

### 21.5 DESIGN CRITERIA

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- 1) The carriageway width for Access roads shall be 7.0 m plus shoulder on each side (as per IRC 52). Drainage trenches shall be constructed at the hill side with adequate cross under drainage.
- 2) The following criteria will apply for the design of the turning areas on the roads:
  - a) Radius of inner edge of the road 30 m
  - b) Radius of the outer edge of the road,  
at the apex of the curve 40 m
  - c) Road width at start and end of the curve 7 m
  - d) Road width at the apex of the curve 10 m
  - e) Maximum longitudinal gradient 8%
  - f) Maximum cross-fall 2%
- 3) Culverts shall be constructed where necessary using a storm of 180 mm/h intensity and duration of 30 minutes for size determination.
- 4) All bridges shall be designed for Class- A loading as per IRC: 6.

### 21.6 SUBGRADE

#### 21.6.1 Scope of Work

Subgrade shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer-in Charge

#### 21.6.2 Material

##### 21.6.2.1 Physical Requirements

The materials used in subgrade shall be soil, moorum, gravel, a mixture of these or any other material approved by the Engineer-in-Charge. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the backfill/ subgrade. The following types of material shall be considered unsuitable for backfill:

- a) Materials from swamps, marshes and bogs.
- b) Peat, log, stump and perishable material: any soil that, classifies as OL, OI, OH or Pt in accordance with IS: 1498.
- c) Materials susceptible to spontaneous combustion.
- d) Materials in a frozen condition.
- e) Clay having liquid limit exceeding 70 and plasticity index exceeding 45.
- f) Materials with sails resulting in leaching in the backfill.

### 21.6.2.2 General Requirements

- 1) The materials for subgrade shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same Contract.
- 2) The work shall be so planned and executed that the best available materials are saved for the subgrade and the backfill portion just below the subgrade.
- 3) It shall be ensured that the subgrade material when compacted shall ensure the density requirements as per relevant IRC Standards.

### 21.6.3 Execution and Methodology

#### 21.6.3.1 Setting out

After the site has been cleared where subgrade preparations required the setting out of the road shall be carried out by fixing pegs on both sides at regular intervals as guides before commencing the earthwork.

#### 21.6.3.2 Dewatering

If the subgrade is in an area with stagnant water, and in the opinion of the Engineer-in-Charge it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer-in-Charge and the area of the subgrade shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore it to original condition or compensate the damage at his own cost.

#### 21.6.3.3 Compacting Ground Supporting Subgrade

The sub-grade shall conform to the prescribed lines and grades and loose materials shall be compacted in accordance with IS: 2720 (Part XXVIII), or as directed by the Engineer-in-Charge, so that Sub-base material, when placed, will not mix with sub-grade material.

#### 21.6.3.4 Compaction

- 1) Only the compaction equipment approved by the Engineer-in-Charge shall be employed to compact the different material types encountered during construction. Smooth wheeled, vibratory, pneumatic tyred, sheepsfoot or pad foot rollers, etc. of suitable size and capacity as approved by the Engineer-in-Charge shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

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- 2) The compaction shall be done with the help of vibratory roller of 80 to 100 kN static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.
- 3) The Contractor shall demonstrate the efficacy of the equipment, he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer-in-Charge for approval.

### 21.6.3.5 Drainage

The surface of the subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

### 21.6.3.6 Repairing of Damages caused by Rain/Spillage of Water

The soil in the affected portion shall be removed in such areas as directed by the Engineer-in-Charge before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density. Tests shall be carried out as directed by the Engineer-in-Charge to ascertain the density requirements of the repaired area. The Contractor at his own cost, including the arranging of machinery/equipment for the purpose, widening of the cut, if any, shall carry out the work of repairing the damages including.

## 21.7 GRANULAR SUBBASE COURSE

### 21.7.1 Scope of Work

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer-in-Charge. The thickness of sub-base course shall not be less than 150 mm.

### 21.7.2 Material

#### 21.7.2.1 General

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer-in-Charge. The material shall be free from organic or other deleterious constituents and conform to relevant IRC Standards.

### 21.7.2.2 Strength of Subbase

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished. When directed by the Engineer-in-Charge, this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the "quality" of materials, as may be necessary.

### 21.7.3 Execution and Methodology

#### 21.7.3.1 Preparation of Subgrade

Immediately prior to the laying of sub-base, the subgrade already finished to relevant specifications as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with two passes of 80 -100 kN smooth wheeled roller.

#### 21.7.3.2 Spreading and Compacting

- 1) The sub-base material shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer-in-Charge.
- 2) When the sub-base material consists of combination of materials mentioned in relevant clause for its materials, mixing shall be done mechanically by the mix-in-place method. Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small-sized jobs. The equipment used for mix-in -place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer-in-Charge, trial runs with the equipment shall be carried out to establish its suitability for the work. Moisture content of the loose material shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer-in-Charge so that, at the time of compaction, it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS: 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.
- 3) Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer upto 225 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static

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weight with plain drum or pad footdrum or heavy pneumatic tyred roller of minimum 200 to 300 kN weight having a minimum tyre pressure of 0.7 MN/m<sup>2</sup> or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional crossfall and super-elevation and shall commence at the edges and progress towards the centre for portions having crossfall on both sides. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and crossfall (camber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour. Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material determined as per IS: 2720 (Part 8).

- 4) The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

### 21.8 WBM /WMM BASE COURSE

#### 21.8.1 Scope of Work

- 1) This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subbase in accordance with the requirements of these Specifications.
- 2) The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the drawings or as directed by the Engineer-in-Charge.
- 3) The thickness of a single compacted WBM / WMM layer shall not be less than 150mm when vibrating or other approved types of compacting equipment are used.

#### 21.8.2 Material

##### 21.8.2.1 Physical / Grading Requirements

- 1) Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have-at least two fractured faces. The aggregates shall conform to the physical/grading requirements set forth in relevant IRC Standards.
- 2) If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5).

##### 21.8.3 Execution and Methodology

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### 21.8.3.1 Preparation of Base

The surface of the subbase to receive the WBM course shall be prepared to the specified lines and cross fall (camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained if necessary by sprinkling water. Any sub-base surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (leveling course).

### 21.8.3.2 Spreading of Coarse Aggregates

The coarse aggregates are spread uniformly to proper profile to even thickness upon the prepared foundation and checked by templates. The thickness of the compacted WBM shall be 150 mm.

### 21.8.3.3 Compaction

- 1) After the coarse aggregates have been laid to the required thickness, grade and cross fall/camber the same shall be uniformly compacted, to the full depth with suitable roller. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly overlapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.
- 2) In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled.
- 3) Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected" at once as specified and/or removed and made good.
- 4) Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

### 21.8.3.4 Sprinkling and Grouting

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After coarse aggregates are compacted properly the dry screenings are applied gradually over the surface to fill the interstices in three or more applications. Subsequently the surface is sprinkled with water, swept and rolled. Wet screenings are swept into the voids using hand brooms till the coarse aggregates are well bonded and firmly set.

### 21.8.3.5 Application of Binding Material

After the application of screening and rolling, binding material is applied at a uniform and slow rate at two or more successive thin layers. Binding material consists of fine grain materials. Kankar nodules or lime stone dust may also be utilized if locally available. If the screening used consists of crushable material like moorum or soft gravel, there is no need to apply binding material, unless the plasticity index value is low. After each application of binding material, the surface is sprinkled with water and wet slurry swept with brooms to fill the voids. This is followed by rolling with 80-100KN rollers.

### 21.8.3.6 Setting and Drying

After final compaction, WBM base coarse are allowed to set overnight. On the next day the defective spots are located and filled with screenings and binding material, lightly sprinkled with water, if necessary and rolled. No traffic is allowed till the WBM layer sets and dries out.

## 21.9 CONCRETE PAVEMENT

### 21.9.1 Scope

- 1) The work shall consist of construction of plain cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross sections shown on the drawings, over a sub-grade/ granular sub base / WBM base course. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer -in- Charge.
- 2) The thickness of pavement slab shall be 225 mm of grade M40/A25 of concrete. However, the thickness of the concrete pavement may be modified to suit the site conditions with the approval of Engineer - in -Charge.

### 21.9.2 Material

#### 21.9.2.1 Concrete

All the constituent materials for the production of concrete shall be as per Section B.9 of the Technical Specifications.

### **21.9.2.2 Joint Filler /Joint Sealing Compound**

Joint filler / Joint Sealing Compound shall be as per the Section B.12 of Technical Specifications.

### **21.9.3 Joints**

All the joints shall be constructed as specified in Specifications/relevant standards for Concrete Pavement Works.

### **21.9.4 Weather and Seasonal Limitations**

#### **21.9.4.1 Concreting during Monsoon Months**

When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulin or other water proof cloth shall be provided along the line of the work. Any time when it rains, all freshly laid concrete which had not been covered for curing purposes shall be adequately protected. Any concrete damaged by rain shall be removed and replaced. If the damage is limited to texture, it shall be retextured in accordance with the directives of the Engineer-in-Charge.

#### **21.9.4.2 Concreting in Hot Weather**

No concreting shall be done when the concrete temperature is above 30 degree Centigrade, Besides, in adverse conditions like high temperature, low relative humidity, excessive wind velocity, imminence of rains etc, if so desired by the Engineer-in -Charge, tents on mobile trusses may be provided over the freshly laid concrete for a minimum period of 3 hours as directed by the Engineer-in-Charge. The temperature of the concrete mix on reaching the paving site shall not be more than 30° C. To bring down the temperature, if necessary, chilled water or ice flakes should be made use of. No concreting shall be done when the concrete temperature is below 5 degree Centigrade and the temperature is descending day before the day of construction of slab. Any deficiencies noted by the Engineer-in-Charge shall be rectified by the Contractor who shall then re-apply for approval of the affected stakes. Work shall not proceed until the Engineer-in-Charge has given his approval.

### **21.9.5 Execution and Methodology**

#### **21.9.5.1 General**

A systems approach may be adopted for construction of the pavement, and the Method Statement for carrying out the work, detailing all the activities including indication of time-cycle, equipment, personnel etc, shall be got approved from the Engineer-in-Charge before the commencement of the work. The above shall include the type and the hauling arrangement and paving equipment. The

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capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of atleast 300 m in one day.

### 21.9.5.2 Batching and Mixing

Batching and mixing of the concrete shall be done in batching and mixing plant located at a suitable place and distance, duly approved by Engineer-in-Charge considering the properties of the mix and the transporting arrangements available with the Contractor. However sufficient space for stockpiling of cement, aggregates and stationary water tanks shall also be taken into account.

### 21.9.5.3 Paving Equipment

- 1) The concrete shall be placed with an approved fixed form or slip from paver with independent units designed to (i) spread, (ii) consolidate, screed and float-finish, (iii) texture and cure the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary and so as to provide a dense and homogeneous pavement in conformity with the plans and Specifications. The paver shall be equipped with electronic controls to control/sensor line and grade from either or both sides of the machine.
- 2) Vibrators shall operate at a frequency of 8300 to 9600 impulses per minute under load at a maximum spacing of 60 cm. The variable vibration setting shall be provided in the machine.

### 21.9.5.4 Concrete Saw

The Contractor shall provide adequate number of concrete saws with sufficient number of diamond-edge saw blades. The saw machine shall be either electric or petrol/diesel driven type. A water tank with flexible hoses and pump shall be made available in this activity on priority basis. The Contractor shall have at least one standby saw in good working condition. The concreting work shall not commence if the saws are not in working condition.

### 21.9.5.5 Hauling and Placing of Concrete

- 1) Hauling of concrete  
Freshly mixed concrete from the central batching and mixing plant shall be transported to the paver site by means of trucks/tippers of sufficient capacity and approved design in sufficient numbers to ensure a constant supply of concrete. Covers shall be used for protection of concrete against the weather. The trucks/tippers shall be capable of maintaining the mixed concrete in a homogeneous state and discharging the same without segregation and loss of cement slurry. The feeding to the paver is to be regulated in such a way that the

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paving is done in an uninterrupted manner with a uniform speed throughout the day's work.

### 2) Placing of concrete

Concrete mixed in central mixing plant shall be transported to the site without delay and the concrete which, in the opinion of the Engineer-in-Charge, has been mixed too long before laying will be rejected and shall be removed from the site. The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing 234 shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C to 30°C. Trucks/tippers delivering concrete shall not run on plastic sheeting nor shall they run on completed slabs until after 28 days of placing the concrete. The Paver shall be capable of paving the carriageway as shown in the drawings, in a single pass and lift.

- 3) In all cases, the temperature of the concrete shall be measured at the point of discharge from the delivery vehicle.
- 4) The addition of water to the surface of the concrete to facilitate the finishing operations will not be permitted except with the approval of the Engineer-in-Charge when it shall be applied as a mist by means of approved equipment.
- 5) If considered necessary by the Engineer-in-Charge, the paving machines shall be provided with approved covers to protect the surface of the slab under construction from direct sunlight and rain or hot wind.
- 6) As soon as the side forms are removed, edges of the slabs shall be corrected wherever irregularities have occurred by using fine concrete composed of one part of cement to 3 parts of fine chips and fine aggregate under the supervision of the Engineer-in-Charge.

### 21.9.6 Opening to Traffic

No vehicular traffic shall be allowed to run on the finished surface of a concrete pavement within a period of 28 days of its construction and until the joints are permanently sealed. The road may be opened to regular traffic after completion of the curing period of 28 days and after scaling of joints is completed including the construction of shoulder, with the written permission of the Engineer-in-Charge.

## 21.10 REPAIR AND MAINTENANCE OF ACCESS ROADS

### 21.10.1 Scope of Work

The work shall consist of following activities;

- 1) Cleaning and sweeping
- 2) Repair and maintenance of side drains culverts and other drainage system
- 3) Clearance of slips, boulders, stones and slush,

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- 4) Filling of pot holes,
- 5) Periodic sprinkling of water
- 6) Maintenance of road up to reasonable good riding condition.

### 21.11 SHOULDERS

#### 21.11.1 Scope of Work

The work shall consist of constructing shoulder on either side of the concrete pavements in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer-in-Charge.

#### 21.11.2 Material

Shoulder for concrete pavement shall consist of sub-base course as shown in the drawings and materials for the same shall conform to relevant specifications of the corresponding items.

#### 21.11.3 Execution and Methodology

##### 21.11.3.1 General

- 1) The sequence of operations shall be such that the construction of shoulder is done in layers each matching the thickness of adjoining pavement layer. Only after a layer of pavement and corresponding layers shoulder portion have been laid and compacted, the construction of next layer of pavement and shoulder shall be taken up.
- 2) Where the materials in adjacent layers are different, these shall be laid together and the pavement layer shall be compacted first. The corresponding layer in shoulder portion shall be compacted thereafter. The adjacent layers having same material shall be laid and compacted together.
- 3) Compaction requirement of shoulder for concrete pavement shall be as per IS:2720 (Part 8). In the case of bituminous pavement, work on shoulder, shall start only after the pavement course has been laid and compacted.
- 4) During all stages of shoulder construction, the required cross fall shall be maintained to drain off surface water. Regardless of the method of laying, all shoulder construction material shall be placed directly on the shoulder. Any spilled material dragged on to the pavement surface shall be immediately removed, without damage to the pavement, and the area so affected thoroughly cleaned.

##### 21.11.3.2 Brick / Stone Block Edging

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The bricks/stones block edging shall be provided for shoulders of concrete pavement. They shall be laid on edge, with the length parallel to the transverse direction of rolled into position by a light roller and made flush with the finished level of the pavement. No extra payment for brick/stone block edging shall be done and shall be included with payment for shoulders.

### 21.12. LINED DRAIN

#### 21.12.1 Scope of Work

This work shall consist of constructing Lined Drain in accordance with the requirements of these Specifications and to the lines, grades, dimensions and other particulars shown on the drawings or as directed by the Engineer-in-Charge. Schedule of work shall be so arranged that the drains are completed in proper sequence with road works to ensure that no excavation of the completed road works is necessary subsequently or any damage is caused to these works due to lack of drainage.

#### 21.12.2 Execution and Methodology

- 1) Lined Drains shall be excavated to the specified lines, grades, levels and dimensions as shown in the drawing or as directed by Engineer in charge. The excavated material shall be removed from the area adjoining the drains and if found suitable, utilized in backfill/subgrade construction. All unsuitable material shall be disposed of as directed.
- 2) The excavated bed and sides of the drains shall be dressed to bring these in close conformity with the specified dimensions, levels and slopes. Where so indicated, drains shall, be lined or turfed with suitable materials in accordance with details shown on the drawings.
- 3) All works on drain construction shall be planned and executed in proper sequence with other works as approved by the Engineer-in-Charge, with a view to ensuring adequate drainage for the area and minimizing erosion / sedimentation
- 4) Materials and construction of each item of Lined Drain shall conform to relevant specifications of the corresponding items.

### 21.13 MEASUREMENT AND PAYMENT

#### 21.13.1 Construction of Access roads and Temporary site roads

- 1) Measurement for payment and payment of the items defined in Section 21.1 for access roads & temporary site roads shall be made as per the items given elsewhere in the Technical Specifications.

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- 2) For measurement and payment of items specified in BOQ refer to respective/relevant clauses of latest IRC / CPWD/ Arunachal Pradesh (State) SOR.

### 21.13.2 Maintenance and Repair Works of Access Roads

- 1) Measurement for payment for the repair and maintenance of access road will be km-months which will be calculated as the number of months for which the road is under use multiplied by the length of road in Kilometers.
- 2) Payment will be made at the Unit Prices per Km-month entered in the Bill of Quantities, which shall include all costs of labour, equipment, and materials required for repair and maintenance as given in clause 21.3.3 of this specifications.
- 3) Slide / Malba clearance of more than 20 cum at one location on access road (permanent) shall be payable at the unit price per cubic meter entered in the bill of quantities.
- 4) Payment for repair and maintenance of Roads with various items of WBM and Concrete Carpeting ordered by the Engineer-in-Charge, due to damages of WBM/ concrete Carpeting, during the contract period will be made on completion of WBM (all layers) and/or carpeting works as per actual execution at site subject to a yearly maximum limit of 33.3% of BOQ provision for repair in WBM and carpeting work of above items or 10% of the original executed quantity of such items of work, during construction on a stretch of road, whichever is lesser. The payment of the WBM & Carpeting items will be made only after completion of WBM and/or carpeting work. No measurement of repair or payment of the quantity will be made within six month of completion of WBM and/or carpeting work of any stretch of road.
- 5) No payment will be made for the construction/maintenance of roads to Quarry and borrow areas and other roads within the contractor's construction facility areas and the cost thereof shall be deemed to be included in the other items of the Works.

### 21.13.3 Subgrade

- 1) Measurement and payment for Sub grade preparation, and other associated work required or as directed by the Engineer-in-charge will be made on the basis of quantities in square meter of completed road.

### 21.13.4 Subbase Course

- 1) Measurement for payment for Granular Sub base preparation, and other associated work required or as directed by the Engineer-in-charge will be made on the basis of quantities in cubic meter of completed road.
- 2) Payment will be made at the Unit Price per cubic meter entered in the Bill of Quantities for the Sub base course preparation for the Access roads.

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### 21.13.5 WBM /WMM Base Course

- 1) Measurement for payment for WBM base course preparation, and other associated work required or as directed by the Engineer-in-charge will be made on the basis of quantities in cubic meter of completed road.
- 2) Payment will be made at the Unit Price per cubic meter entered in the Bill of Quantities for the WBM base course preparation for the Access roads.

### 21.13.6 Construction of Shoulders

- 1) Measurement for payment for Shoulder preparation, and other associated work required or as directed by the Engineer-in-charge will be made on the basis of the meters of completed road.
- 2) Payment will be made at the Unit Price per cubic meter entered in the Bill of Quantities for the shoulder preparation for the Access roads.

### 21.13.7 Pavement Concrete

- 1) Measurement for Payment for Cement Concrete pavement shall be in square meters with specified thickness and shall be paid per cubic meter of concrete at the rate as entered in the Bill of Quantities.

### 21.13.8 Lined Drain

- 1) Measurement for Lined Drain shall be per running meter length of the drain. Payment for the construction of Lined Drain shall be done at the unit rate entered in the Bill of Quantities.
- 2) Payment for Lined Drain shall be made at unit rates provided in the BOQ which is inclusive of all items such as excavation, dressing the sides and bottom; providing lining, concrete and plastering; providing, laying and compacting backfill and bed of granular material, including full compensation for all materials, labour, tools, equipment and other incidentals to complete the work as shown on drawings or directed by Engineer-in-Charge with all leads and lifts. Provision of inlets, gratings, sumps, outlet pipes, bedding, disburers, shuttering, stone soling below lined drains etc. where ever required shall be incidental to construction drain.

### 21.13.9 Other items of BOQ

There are various items in the BOQ except above items, which are taken from the Schedule of rates. Their specification, measurement and payment will be governed by relevant clauses of latest IRC / CPWD/ State SOR/Specification .

### 21.14 EXCLUSIONS

No extra payment will be made for the following:

- 1) Extra work caused by the Contractor's negligence in setting-out the structures and slopes,

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- 2) Rectification, removal and replacement of the materials which during the placement or afterwards have been contaminated with foreign matter, mixed with unsuitable materials, or lost due to erosion,
- 3) Extra work or material required to repair damages to the temporary or final surfaces caused by the erosion or travel of the construction equipment,
- 4) Stockpiling, re-handling, reloading, and transport of materials which can not be directly placed in the final locations after being excavated,
- 5) Damage and repair to the concrete structures caused by Contractor's operations,
- 6) Additional passes of the compacting equipment ordered by the Engineer-in-Charge if he determines that a higher degree of compaction than specified is required.
- 7) Construction and maintenance of temporary site roads, Roads to quarry/borrow /dumping areas etc.

**END OF SECTION B.21**