

PART I: GENERAL SPECIFICATIONS

(Volume – 2)

The General Specifications shall be National Highway Authority's General Specifications (December 1998)

PART II: SPECIAL SPECIFICATIONS

SS- 1 ADDENDUM TO NHA GENERAL SPECIFICATIONS (DEC 1998)

ITEM 101 CLEARING AND GRUBBING

101.1 Description

Delete & Replace by

This work shall consist of removal to the specified depth, grubbing and disposal of all surface objects, as and where directed in writing by the Engineer, stumps, roots, bushes and trees with upto 300 mm girth, vegetation, logs, rubbish and other objectionable material except such objects as are designated to remain or are to be removed in accordance with other section of specification.

101.2.1 Clearing/Grubbing

Para 5 Delete & Replace by

All trees having girth upto 300 mm measured at (600) mm above ground with any height and falling within the construction limits shall be felled & removed by the contractor. The excavation and removal of trees, roots and stumps including backfilling and compacting of holes and restoring the natural ground to the original condition shall be responsibility of the contractor for which no extra payment shall be made to him. The trees, stumps & roots remains the property of the Employer, which shall be delivered at designated place as directed by the Engineer.

101.3.1 Measurement

Para 1 Delete & Replace by

Clearing and grubbing will be measured for payment only on areas so designated in writing by the Engineer or shown on the drawings. The quantity to be paid for shall be the number of square meters satisfactorily cleared and grubbed. Any tree having girth of upto 300 mm (measured 600 mm above ground level) shall be measured to be under this item.

ITEM 102 REMOVAL OF TREES

102.4.1 Measurement

Delete & Replace by

Engineer and Contractor shall jointly measure the girth and number of trees to be removed under this item. Any tree having a girth of upto 300 mm measured six hundred (600) mm above ground level shall not be measured under this item, as the same shall be removed under item "Clearing and Grubbing".

102.4.2 Payment
Delete & Replace by

The quantities determined as provided above shall be paid for at the contract unit price for the pay item mentioned below and shown in the Bill of Quantities which price shall be deemed to include all cost of labour equipment and incidental related to the item.

Pay Item No.	Description	Unit of Measurement

102	Removal of trees, 301 mm girth or above	Each

ITEM 106 EXCAVATION OF UNSUITABLE OR SURPLUS MATERIAL**106.2 Construction Requirements**
Para 2 Delete & Replace by

Any material surplus to these requirement or any material declared in writing by the Engineer to be unsuitable shall be disposed of and leveled in thin layers by the Contractor outside the right of way as directed by the Engineer. The Engineer shall decide regarding the unsuitability of the material by conducting appropriate laboratory tests.

ITEM 108 FORMATION OF EMBANKMENT**108.2 Material Requirements**
108.2.a Delete & Replace by

- a) Contractor shall use AASHTO Class A-1, A-2, A-3, A-4 soil as specified in AASHTO M-145 or other material approved by the Engineer,

108.3.5 Formation of Embankment in Water Logged Areas
Add following Para in the end of section

No additional cost shall be made against this work, cost of this work is deemed to be included in formation of embankment.

ITEM 110 IMPROVED SUB GRADE**110.2 Material Requirements**
Para 3 Delete & Replace by

The blended mixture when compacted to ninety five (95) percent of the maximum dry density determined by AASHTO T 180-D Method, shall exhibit a laboratory soaked CBR (96 hours) of not less than 15, and plasticity index not more than 6 or as specified in the drawings.

ITEM 201 GRANULAR SUBBASE**201.2 Material Requirements**
Delete grading A and replace by

Grading Requirements for Subbase Material		
Sieve Designation	Mass Percent Passing Grading	
mm	Inch	A
60.0	(2.1/2)	100
50.0	(2)	90-100
25.0	(1)	50-80
9.5	(3/8)	42-75
4.75	No.4	35-70
2.0	No.10	15-40
0.425	No.40	8-20
0.075	No.200	2.8

ITEM 209 SCARIFICATION OF EXISTING BITUMINOUS SURFACING AND/OR BREAKING OF ROAD PAVEMENT STRUCTURE

Entire item deleted and replaced by

209.1 Description

This item shall consist of scarification of existing road surface or breaking of existing road pavement structure to ensure bondage of new layer with the existing road pavement and to ensure drainage of water below the surface of freshly laid water bound macadam (WBM) base. The surface on which the base material is to be constructed shall be approved and accepted by the Engineer prior to placing the WBM.

209.2 Construction Requirement

The method of scarification of road surface or breaking of pavement structure shall be proposed by the contractor and approved by the Engineer, in accordance with the requirements under site conditions.

The Contractor shall dismantle the existing bituminous surfacing/surface dressing layer(s) from such portion of the areas as shown on the Drawings or as directed by the Engineer from where the full depth of surfacing is to be scarified / removed. The dismantled material shall be transported and stockpiled at locations designated by the Engineer. If required, the material will be disposed of away from the site as per directions of the Engineer. No payment will be made for dismantling from places other than those directed by the Engineer. After the removal of the existing pavement surface, the existing WBM base/subbase surface shall be scarified, watered and re-compacted to the specified density together with a thin layer to be added of WBM base/subbase material before laying of subsequent layer(s) of WBM base/subbase as per the directions of the Engineer.

The payment for such compaction shall not be made separately but it is considered incidental and subsidiary to be works performed under this section. The dismantling of existing surfacing/surface dressing and removal shall be made in such a way that the existing WBM base/subbase is least disturbed.

Incase of raising and/or where existing pavement structure (WBM base/subbase) is required to be removed, as directed by the Engineer, it shall be broken off / removed and reused as per item SS-3 according to the satisfaction of the Engineer. The payment for breaking, removal and reusing shall be made under item SS-3.

The surface obtained after scarification or breaking the existing pavement shall be compacted to the density prescribed under item 201.3.4 or Item 108.3.1 respectively as the case may be and the Payment of such compaction shall be included in the contract price for item 209.

209 .3 Measurement and Payment

209.3.1 Measurement

The quantity for road pavement structure broken and removed, stock piled, processed and used shall be measured in Cu. meter and paid under item SS-3. No separate measurement or payment shall be made under item 209.

The quantity to be paid for shall be measured in square meters for removal of bituminous surfacing/ surface dressing as shown on the Drawings or as directed and accepted by the Engineer for payment.

209.3.2 Payment

The above quantities shall be paid for at the Contract unit price for the pay item listed below and shown in the bill of quantities, which price and payment shall be full compensation for furnishing all labour, tools, equipment and incidentals for

performing all work involved in this item of work and in accordance with these Specifications and directions of the Engineer.

Pay Item No.	Description	Unit of Measurement
209	Scarification and removal of Existing bituminous surfacing and disposal	SM

ITEM 400(A) BRIDGES AND CULVERTS

400.A.3 Construction Requirements

a. Clearing the Site

Add text "bridges and culverts" after text "concrete pavement" in the forth line of first paragraph.
and add text " All faces of concrete which are to come in contact with the backfill soil or pavement materials shall be covered with two coats of hot bitumen of approved quality, before placing of any material around concrete." an the end of the first paragraph.

ITEM 410 BRICK MASONRY

410.2.5 Bricks

last line of para "Compressive strength shall not be less than 140.62 kg/sq.cm (2000 psi)."**Replaced by**" Compressive strength shall not be less than 85 kg/cm2 (1200 psi)."

Add item 410.2.6 Testing of Bricks

a) Dimensions:

10 bricks shall be selected at random from stacks per 50,000 of bricks, cleaned of blisters, kiln, rubbish, and laid touching edge to edge for measuring length, breadth and height. Dimension shall be measured with a steel tape correct to 1mm, Dimension tolerance shall be $\pm 8\%$ from the standard dimension, which will be 10 mm less than the required dimension to allow for mortar joints. Tolerance on the plus side is acceptable provided nothing extra shall be payable for thicker masonry.

The sample brick shall be thoroughly wetted, the frog filled with CM (1:3) cured for 24 hours under wet gunny bags and 3 days under water; on removal from water, the test sample shall be wiped dry. The test sample shall be placed between plywood

sheets of 3mm thick in such a way that frog project upward and brick correctly center in the machine. The length, breadth of each brick, shall be measured correct to one mm. The load shall be applied at the rate of 140 kg / sq.m. per minute. The strength shall be worked out in kg/sq.m. as follows:

$$\text{Compressive strength in kg/cm}^2 : \frac{\text{Max. load at failure (in kg.)}}{\text{Area of bricks (in sq.m.)}}$$

The average of the five test results shall be the compressive strength.

b) Water absorption:

The sample of the bricks (5 Nos.) selected at random shall be dried in a ventilated oven for 48 hrs. at 110°C to 115°C, then allowed to cool for at least 2 hours under fan at room temperature. Find out the weight (W1) in kg. At room temperature. After weighing, the sample bricks shall be kept under water for a period of 24 hours. The brick shall be removed from water and wiped with a damp cloth and find out the weight (W2) in kg. Calculate the absorption percentage of each sample as follows:

$$\text{Absorption percentages} = \frac{W2 - W1}{W1} \times 100$$

The average of five test of brick sample being taken as the percentage.

The water absorption shall not exceed 20%.

c) Testing

One series of all the above tests shall be carried out for every lot of 50,000 bricks at an approved Laboratory at the cost of the Contractor, including cost of transporting the specimens to the Laboratory.

ITEM 610 PRECAST CONCRETE POSTS AND MARKERS

610.1 Description
Delete and Replace by

The work shall consist of furnishing and placing precast concrete Kilometer, Ten Kilometer, Guide Posts, delineator and Right of Way Markers, complete including painting and lettering in accordance with the Drawings and specifications or as directed by the Engineer.

6.10.4.2 Payment
Delete & Replace by

The accepted quantities of posts and markers shall be paid for at the contract unit price per unit of measurement for the pay items listed below and shown in Bill of Quantities which price shall be compensation for furnishing, excavation, placing, erection, painting, lettering and for all costs including labour, tools, and incidentals necessary to complete the work prescribed in these items:

Pay Item No.	Description	Unit of Measurement
610a	Guide Post.	Each
610b	Right of Way Marker.	Each
610c	Kilometer Post.	Each
610d	Ten Kilometer Post.	Each
610e	Delineator	Each

SS-2 ROCK FILLING FROM BORROW IN PONDING AREA

2.1 DESCRIPTION

This work shall consist of hauling of rock from borrow/quarry and placing in ponding area according to the typical section, level, lines and drawings or as directed by the Engineer.

2.2 Material Requirements

Borrow rock for filling in ponding area shall be hard, tough, sound, dense and durable, resistant to the action of water and suitable in all respects for the purpose intended.

Sample of rock to be used shall be submitted to and approved by the Engineer before use in permanent work.

Rock shall comply the following requirements.

- Los Angeles Abrasion shall not be more than 40 percent.
- Apparent specific gravity not less than 2.5.
- Water absorption shall not be more than 1 percent.
- Weight of stones shall be ranging between 50 kg to 70 kg.

Shale and fractured rock shall not be allowed for filling in ponding area.

2.3 Measurement and Payment

2.3.1 Measurement

Quantity of rock to be paid for shall be measured by the theoretical volume in place in cubic meter as shown in drawing/ typical cross section. No-allowance shall be given for rock materials placed outside the theoretical limits, shown on the cross section.

2.3.2 Payment

The accepted quantity measured as above shall be paid for at the contract unit price per cubic meter of rock, for the item listed below and shown in the Bill of Quantities, which price and payment shall constitute full compensation for furnishing all materials, hauling, placing, watering, rolling, labour, equipment, tools and incidental necessary to complete this item.

Part No.	Description	Unit of Measurement
SS	Rock filling in ponding area	CM

SS-3 REMOVAL AND REUSE OF EXISTING WATER BOUND MACADAM

3.1 Description

The work shall consist of removal of existing water bound macadam / subbase, stockpiling and reuse of the dismantled and removed material as a water bound in new pavement structure in conformity to the lines, grades and thickness shown on the Drawings or as directed by the Engineer.

3.2 Material

In the areas shown on the Drawings or as directed by the Engineer, the existing water bound macadam base shall be separately removed to its full depth and the resulting materials collected in piles and carefully loaded and carried away to a stock pile area. All suitable removed materials shall be properly blended and, if necessary, mixed with new materials and crushing the oversize if any in order to bring it to such proportions as required to meet the grading requirements of NHA item no.206 class "B" before being reused as water bound in the construction of the new road structure. Before removal of the existing water bound, the bituminous surfacing/surface dressing shall be separately broken up, carefully removed, and stock piled or disposed of in accordance with NHA Specifications or as directed by the Engineer.

Fine aggregate (filler material or screenings) shall consist of natural sand or crushed stone screening free from clay lumps, dirt or other objectionable materials. The fine aggregate shall be of the following gradation.

Use Compacted US Standard Sieve Size	Levelling/Base Course 50 to 100 mm Percent Passing by Weight
9.5 mm (3/8)	100
4.75 mm (No.4)	85-100
0.15 mm (No. 100)	10-30

3.3 CONSTRUCTION REQUIREMENTS

3.3.1 Spreading

Refer to NHA specification item no.206

3.3.2 Compaction

The moisture content of water bound material shall be adjusted prior to compaction by watering with approved sprinklers mounted on trucks or by drying out, as required, in order to obtain the required compaction.

The water bound material shall be compacted by means of approved vibrating rollers or steel wheel rollers (rubber tire rollers may be used as a supplement), progressing gradually from the outside towards the centre, except on superelevated curves, where the rolling shall begin at the low side and progress to the high side. Each succeeding pass shall overlap the previous pass by at least one third of the roller width. While the rolling progresses, the entire surface of each layer shall be properly shaped and dressed with a motor grader, to attain a smooth surface conforming to the required lines and grades.

Following the initial rolling, dry screenings shall be applied uniformly over the surface. Dry rolling shall be continued while screenings are being applied. The surface shall be swept with mechanical or hand brooms to aid spreading of the screenings.

When the interstices in the coarse aggregate are filled screenings, the surface shall be sprinkled with water until it is saturated. The rolling, sprinkling and application of additional screenings shall continue until a grout is formed that fills all the voids and forms a wave of grout in front of the roller.

Any areas inaccessible to rolling equipment shall be compacted by means of mechanical tampers.

The compaction of the water bound layer shall be continued until the result is satisfactory to the Engineer.

If the layer of water bound material, or part thereof does not conform to the required finish, the Contractor shall, at his own expense, rework, water, and recompact the material before the next layer of the pavement structure is constructed.

Immediately prior to the placing of the first layer of base course, the water bound layer (both under the travelled way and the shoulders) shall be to the required level and shape. Any watering and reshaping of the surface of the water bound will be at the Contractor's expense.

No material for construction of the base shall be laid until the water bound has been approved by the Engineer.

3.3.3 Construction Control Testing

Tests for compliance with the requirements of NHA specification item 206 will be made as often as deemed necessary and to the satisfaction of the Engineer.

3.4 Measurement and Payment

The quantity of the water bound to be paid for shall be measured in cu.m of the volume of the material derived from the existing water bound as shown on the Drawings or approved by the Engineer. Any wastage/losses of the material due to over excavation during the removal of surfacing/surface dressing and other losses in deriving, transportation and stockpiling of the existing material for reuse as water bound shall be replaced with additional new material, without any payment for this additional material.

The payment of this item will be deemed to include the cost of removal of existing water bound/aggregate, transportation, stockpiling, blending and mixing with additional coarse or fine materials and crushing the oversize if required to bring it within the specified gradation and to cover up any wastage or losses during deriving of the existing materials, placing and compacting in accordance with the Specification requirements. The payment of this item also includes the compaction of exposed surface after removal of water bound macadam in accordance with the specification requirement.

The quantities determined as provided above shall be paid for at the Contract unit price, for the pay item listed below and shown in the Bill of Quantities, which price and payment shall be full compensation for all the costs necessary for proper completion of the work prescribed in this Section.

The quantities paid for under this Section shall be the quantities actually measured from the existing pavement section before deriving and reuse in the new pavement as described above.

The difference in the quantity of the material placed, laid and compacted between total volume of water bound and the volume of the existing water bound material derived, laid and compacted shall be paid for under the pay item included in item no SS-3.

Pay Item No.	Description	Unit of Measurement
SS-3	Removal and reuse of existing water bound macadam and bring it to the required specification	CM

SS- 4 REPAIR AND STRENGTHENING OF STRUCTURES

4.1 Description

The work shall consist of furnishing all materials, labour and equipment in performing all operations, in connection with the repair and strengthening of existing reinforced concrete, brickwork, masonry and steel structures.

4.2 Condition Survey and Cleaning

The Contractor shall carryout the Condition Survey of the existing structures. For each and every structure details of the elements alongwith the condition shall be recorded and submitted to the Engineer for his decision. The results shall be in the form drawings alongwith photographs. The Engineer shall decide the level and details of rehabilitation required. No separate payment shall be made to the Contractor on this account. The rates and prices submitted by the Contractor shall be deemed to include the cost of all surveys and investigations.

The Contractor shall also carryout cleaning of the culverts and bridges and shall remove all vegetation organic matter from the structures. In addition to this desilting of the culverts shall also be carried out. No additional payment shall be made on this account. The rates and prices submitted by the Contractor shall be deemed to include the cost of all cleaning, removal of organic matter and de-silting.

4.3 Material

The materials for concrete shall conform to the requirements of Section 401 or otherwise specified.

The materials for brickwork and masonry shall conform to the requirements of Sections 410 respectively, or otherwise specified.

The reinforcement shall conform to the requirements of Section 404.

Epoxy resins shall be obtained from an approved manufacturer, such as Master Builder Technologies, Sika, Fosroc or equivalent whose products have proven to be highly satisfactory in similar works.

The epoxy to be used shall conform to the manufacturer's specifications and to the following requirements:

- To have mechanical strength and final appearance similar to that of the replaced concrete.
- To be highly adhesive (adhesion greater than concrete tensile stress).
- To have modulus of elasticity 15 to 25% less than that of the replaced concrete in order to ensure a proper bond.

- To be abrasion resistant.

Anticorrosive epoxy paint, or approved equivalent, shall be used wherever the reinforcing steel is found to be uncovered.

4.4 Construction Requirements

4.4.1 Reinforced Concrete Repair

4.4.1.1 Repair of Reinforced Concrete Surface or Masonry

- Fine cracks shall be filled up with the binding material epoxy, such as, non-shrinkage Masterflow 524 or equivalent, using injection system. Other cracks shall be routed out by cutting grooves, and filled up with non-shrink grout of plastic consistency as directed by the Engineer.

4.4.1.2 Repair of Corrosion Induced Reinforced Concrete

- Poor quality, deteriorated, unsound concrete shall be removed by using any concrete removal technique as per job specification, after adequate propping of structure from the ground.
- The surface of the concrete shall be thoroughly cleaned by approved method in order to remove all dirt.
- Full circumference of corroded exposed steel rebars shall be cleaned to bare metal.
- After the removal of concrete, the reinforcement shall be cleaned by sand blasting or any other equivalent approved technique to bare metal. Existing steel shall be painted with an anti corrosive material or approved equivalent. Additional steel dowels shall be used to achieve required development.

4.4.1.3 Repair of Cracked and Sound Concrete

- The rectification of cracked or unsound concrete shall be carried out by plastering.
- All plaster shall be Portland cement plaster, all coats of which shall be mixed in the following proportions by volume or otherwise specified.

One part cement
4 parts sand

Except where hand-mixing of small batches is approved by the Engineer, mechanical mixers of an approved type shall be used for the mixing of mortar. Mortar shall be thoroughly mixed with the proper amount of water until uniform in color and consistency. Retempering will not be permitted. The walls shall be moistened with fresh water and shall be kept damp for 2 hours before the plaster is applied. All masonry joints and concrete surfaces shall be properly prepared before plasterwork is commenced as per the directions of Engineer. Cement slurry shall be

applied to the surface to be plastered and allowed to dry before plasterwork is commenced.

All joints in the masonry work, which are to be plastered, shall be raked out to a depth equal to not less than the width of the joints or as directed by the Engineer. Care shall be taken to avoid chipping of masonry, while raking out the joints. In case of new work, the raking out shall be done when mortar in joints is still green. The concrete surface shall be suitably roughened to provide necessary bound for plaster. All dirt, oil, grease, paint, etc. shall be cleaned and scrubbed with fresh water prior to plastering. Before commencement of plastering, the surface preparation shall be got approved in writing from the Engineer.

In case the thickness of plaster required is more than that specified in the respective item, the same shall be carried out in two layers. A hexagonal wire netting 24 SWG X 3/4" (19 mm) shall be fixed over first layer using 'U' nails or any other suitable arrangement approved by the Engineer and finished in line and level in the final layer. No additional payment shall be made for extra thickness of plaster. The cost of providing G.I. netting and fixing shall be deemed to be included in the rates and prices quoted by the Contractor.

Patches of plaster size 150 mm x 150 mm shall be made at site about 2.0 m apart as gauge to ensure even plaster in one run.

In any continuous face of wall, finishing treatment of any type should be carried out continuously and day-to-day break made to coincide with architectural breaks in order to avoid unsightly junctions. The entire work, including moulding, grooves, band, etc. shall be carried out in line and level.

All plaster work shall be kept damp continuously for a period of 7 days. To prevent excessive evaporation due to weather condition, gunny bags may be hung/kept over the plaster and kept moist for a period of 7 days. In case the contractor fails to carry out the curing work as specified, at any time, on any day, the Engineer shall, without serving any notice, engage at the risk and cost of the contractor, requisite labour, materials and equipment. The cost incurred towards curing operations made shall be recovered from the Contractor.

The plaster on all surfaces shall be perfectly plumb and shall be steel floated finished. The edges and corners shall represent a straight line. No extra payment shall be allowed for jambs, junctions, corners, edges, round surfaces, cement slurry base etc. The rates and prices quoted by the Contractor shall be deemed to include the cost of all materials, workmanship, labour, tools and plants and conformance of the works to these specifications.

4.4.2 Brickwork and Masonry Repair

4.4.2.1 Repair of Brick on Masonry Surface

It is intended to carry out flush pointing of the existing masonry walls of the structure. The mortar to be used for pointing shall be 1:3 cement, sand, mortar with

enough water content to make it workable. Sand, cement and water shall conform to the specifications laid down for the plaster work.

All joints are to raked out or cut out to a minimum depth of 25 mm. Joints which have weathered back deeper or are friable must be cut back to a firm seating. If the parts of the old masonry have weathered they must be replaced by new masonry pieces fulfilling the requirements of brick masonry given in these specifications.

Prior to filling with new mortar pointing, the joint shall be cleaned out by careful brushing or the use of a pneumatic airline. The joint shall be thoroughly flushed out with water from a large water spray using clean potable water to remove dust and loose material. Cement slurry shall be applied to ensure perfect bond between the pointing mortar and old surfaces.

Spray fully cleaned joints with clean 'potable' water on a fine mist setting before placing new mortar to avoid undue suction. Wipe dry, dense non-porous brick of surface water. Push new stiff mortar into the joint from a dampened hawk board and iron in with maximum possible pressure, against the back of the old mortar joint. Use appropriate (to suit joint widths) pointing keys made of flat steel, beaten-out rod or wood or a traditional flat bladed brick trowel, and push in evenly for the full joint width.

In case the loss of mortar in the old work is very deep the Contractor shall use dry mortar with little water and ram it into the joint using wooden hammers as much as possible.

The Contractor shall be paid on the basis of the area to be pointed. The rates and prices quoted by the Contractor shall be deemed to include the supply of all materials, labour, workman, tools and plants necessary to complete the works in all respects.

4.4.3 Connecting old Concrete / Masonry using Dowel bars

In case it is necessary to connect the old concrete with the new concrete or old masonry walls within new ones dowel bars shall be used. The dowel bars shall be drilled into the old concrete / masonry parts as shown on the drawings. After the drilling is complete the hole shall be filled with epoxy of approved specifications.

4.4.4 Removal of old Expansion Joints

In case it becomes necessary to replace the old expansion joints of the bridges they shall be carefully removed by cutting a part of existing slab as shown on the drawings by using hand tools. The old expansion joints shall be handed over to the Employer. Care shall be taken not to damage the deck slabs as much as possible.

Pay Item No.	Description	Unit of Measurement
SS-4(a)	Repair and strengthening of existing structures (bridges):	
	(i) Repair of reinforced concrete surface or masonry	SM
	(ii) Repair of Corrosion induced reinforced concrete	SM
	(iii) Repair of Cracked or Unsound Concrete (Repair of RCC slabs by plaster)	
	a. upto 20 mm thick	SM
	b. more than 20 mm thick upto 50 mm	SM
	(iv) Repair of brick or masonry surface	SM
	(v) Connecting Old Concrete / Masonry Using Dowel Bars	Ton
	(vi) Removal of Old Expansion Joints	M
SS-4(b)	Repair and strengthening of existing structures (culverts and causeways):	
	(i) Repair of reinforced concrete surface or masonry	SM
	(ii) Repair of Corrosion induced reinforced concrete	SM
	(iii) Repair of Cracked or Unsound Concrete (Repair of RCC slabs by plaster)	
	a. upto 20 mm thick	SM
	b. more than 20 mm thick upto 50 mm	SM
	(iv) Repair of brick or masonry surface	SM
	(v) Connecting Old Concrete / Masonry Using Dowel Bars	Ton
	(vi) Removal of Old Expansion Joints	M

SS- 5 DEMOLITION OF EXISTING BRIDGES AND CULVERTS

5.1 Description

This work shall consist of the dismantling, removal, wholly or in part, of bridges and culverts and the satisfactory disposal of all materials.

5.2 Construction Requirements

The Engineer following the indications on the Drawings and actual field verification by contractor/consultant shall specify the extent of dismantling for each structure and the Contractor shall raze, remove and dispose of all remains from the demolished structures.

The Engineer, with the agreement of the Employer shall specify the material to be salvaged which shall become the property of the Employer.

All designated salvageable material shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored by the Contractor at specified places within the project limits. Salvaged material may be disposed of outside the limits of view from the project with written permissions of the property owner on whose property the material is placed. Copies of all agreements with property owners are to be furnished to the Engineer. Cavities left by structural removal shall be filled and compacted to the level of the surrounding ground.

Concrete bridges and culverts in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic. Unless otherwise directed, the sub-structure of existing structures shall be removed down to the natural stream bottom and those parts outside of the stream shall be removed thirty (30) centimetres above ground surface. Where such portions of existing structures be wholly or in part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure. Loose gabions and riprap shall be removed as shown on the Drawings and as directed by the Engineer. The rock material, if found suitable, may be reused for new protection works as approved by the Engineer. Steel and wooden bridges shall be carefully dismantled without unnecessary damage. Steel members shall be match marked, unless such match marking is waived by the Engineer. All salvage material shall be stored as previously specified.

5.3 Measurement and Payment

The work described above shall be paid for at the Contract unit price as specified hereinafter. The payment shall constitute full compensation for demolition, removal and disposal of material as directed by the Engineer and for all labour, equipments, tools and incidentals necessary to complete the work.

Pay Item No.	Description	Unit of Measurement
SS-5(a)	Demolition of bridge	LS
SS-5(b)	Demolition of culverts	
	(i) Slab culvert of single cell	No
	(ii) Slab culvert of two cells	No
	(iii) RCC Box Culverts, single cell	No
	(iv) RCC Box Culverts, Two cells	No
	(v) Brick Masonry Arch Culverts	No
	(vi) Brick Masonry Box Culverts, single cell	No
	(vii) Brick Masonry Box Culverts, Two cells	No
	(viii) Brick Masonry Box Culverts, Three cells	No
	(ix) Pipe culvert	No

SS- 6 LAND ACQUISITION

The Contractor shall be responsible for buying or leasing suitable land which may be required out side the Right of Way for Contractor's Camp, storage, working areas, borrow pits, quarries, sites for dumping excess material and the like and for all necessary reinstatement of such land on completion of the Contract.

The Employer will not pay for the cost of the land or the access from the nearest public road. The Employer will also not pay the legal fees, stamp duty and the like incurred in acquiring the land.

SS - 7 MATERIALS SOURCES

Earth fill, aggregates and rock for use in the Works shall be provided by the Contractor from sources to be identified, sampled, tested and proved by the Contractor. The Contractor will be responsible for surveying and testing to prove the extent and suitability of such materials, for land and royalty/malkana costs, for access roads, site facilities, stripping overburden, separation of materials, processing, site reinstatement and all other costs related to using such materials in the Works, which costs shall be considered as included in the rates for the relevant items in the Bill of Quantities.

SS -8 WORK SCHEDULE

In amplification of the requirements of the Conditions of Contract, the Work Schedule shall be prepared by the Contractor using an up-to-date project management computer software package, and shall be presented in hard copy and on diskette. Recommended programs are Primavera Project Manager or the related SureTrak Project Manager. The Work Schedule should include:

- A multi-layer, fully interlinked logic network showing in detail the project activities, their durations and their dependencies upon one another.
- Programmed dates for order and delivery of plant and materials.
- Complete resource allocations for each activity showing labour (broken down into trades), materials and equipment.
- The cost of each activity based upon the rates in the Bill of Quantities.

SS - 9 ENGINEER'S FACILITIES

9.1 General

The Contractor shall provide and maintain for the period as specified herein, for Contract purposes, the following facilities for the Engineer and his staff:

Engineer's main Residency (Mithi City) and other Residency (Tando Jan Mohammed / Jhuddo)

- a) Office accommodation for Resident Engineer and his staff.
- b) Residential accommodation for Resident Engineer and his staff.
- c) Vehicles for Resident Engineer and his staff.
- d) Engineer's Base Laboratory at all packages.

Engineer's Site Facilities

- a) Field Accommodation (Office cum residential) for Engineer's field staff
- b) Vehicles for field staff.
- c) Field laboratory.
- d) Survey equipment.

The Contractor shall also provide all consumable and pay for all other incidental or running costs and provide and pay for all utilities which include power, gas, water supplies, telephone and/or other means of communication within and off the site.

All facilities shall be completed and ready for use within 15 days of the Engineer's instruction.

The location of accommodations and laboratory facilities shall be as approved by the Engineer.

Contractor shall be responsible for and take all necessary measures to ensure the security of the all the Engineer's facilities and their contents at all times and shall employ guards/watchmen for this purpose.

Details of construction elements of rented buildings for the facility shall be as follows:

- a) Floors should be tiled to suit the purpose of the room.
- b) Walls with plaster on masonry. Finish shall be painting of colour (s) to be agreed with the Engineer. Splash areas of bathroom and kitchen walls are to be ceramic-tiled.
- c) Ceilings shall be plastered to suit the roof construction. Ceilings shall be finished in white distemper.
- d) Roof construction with be reinforced concrete suitably waterproofed and insulated and be constructed to drain to collection points provided with full-

height discharge pipes to galleys at ground level.

- e) Doors and windows will be of solid, tight-fitting construction.
- f) Window sizes should generally be 1.3 m x 1.2 m with plain glass, except for special purpose rooms. Frames should be of steel & painted. All windows should be lockable and provided with fly screens on opening lights.
- g) Internal doors shall be of plywood in steel frames. Good quality door furniture with lever handles will be provided and fixed. Two keys for each lock will be handed over to the Engineer.
- h) External doors may be glazed aluminium or exterior quality timber with steel frames. Good quality door furniture will be provided including security locks and two keys for each lock. Additional fly-screen doors shall be fitted on the outside of external doors.
- i) Wooden doors and frames shall be finished and painted or varnished to suit their location.
- j) Lighting, air conditioning, fans, ventilation, waste disposal, water, gas and electricity installations and supply shall be provided as appropriate to the rooms of the office. Air conditioning and heating installations should be capable of regulating temperatures within 20 minutes of switch-on to between 18 °C minimum and 24° maximum in the offices, assuming an external air temperature of 45°C with over-capacity in the conference room and the laboratory to allow for additional sources of hot air.
- k) There shall be appropriate number of power outlets in each room to allow for the different uses of electrical equipment. Additional outlets shall be installed by the Contractor, if required by the Engineer.
- l) Lighting shall be provided to acceptable standards by fluorescent fittings, placed as agreed with the Engineer. Switches and fittings shall be of good quality manufacture, earthed and properly wired. Exterior lighting shall be provided by street lamps or similar, for the safety and security of the compound.
- m) Back-up power supply by diesel generator shall be provided. The backup generator shall have automatic cut-in in case of failure of the main supply.

The power circuit shall be equipped with voltage regulation to protect electrical equipment from overload and to ensure proper operation of computers and the like.

The generator for each of the accommodation facilities shall be housed in a separate room having noise insulation.

- n) A continuous water supply shall be available for normal use. At least all kitchens shall be provided with potable water. The source shall be tested by

the Contractor and certified as potable. Tests shall be repeated at intervals as directed by the Engineer.

A elevated storage tank in RCC, having a minimum capacity of five thousand (5,000) gallons, shall be available. The elevation of the storage tank shall be so as to provide the distribution system with an operating pressure of 1.06 Kg/sq.cm (15 psi). An alternative underground storage tank with roof storage tank and pump is acceptable.

- p) Continuous supplies of water, gas, electricity and fuel for generators shall be provided by the Contractor who shall be responsible for and pay all costs of installation, connection and maintenance.
- q) The Contractor shall provide and install communications facilities/ operational STD telephone line (2 Nos) with extensions as per requirements with all appurtenances for Resident Engineer office and residential accommodations, and laboratory.
- r) The Contractor shall take appropriate measures to discourage the presence or entry to the buildings of termites," cockroaches and the like. Such measures may include chemical treatment of foundations and sealing of joints in construction.

9.2 Engineer's main Residency (Mithi City) and other Residency (Tando Jan Mohammed / Jhuddo)

9.2.1 Resident Engineer Office Accommodation

A. General

The Contractor shall provide the office accommodation for the whole Contract Period. The office accommodation shall be provided in a rented building to be hired by the Contractor for this purpose. The building shall be located in a safe and clean area of the city. The location and construction of the rental accommodation shall be approved by the Engineer. The office accommodation shall be of minimum 6 to 7 office rooms of suitable sizes, a conference room, 4 toilets with washing facilities, kitchen and a tea room.

The rental accommodation shall have construction in accordance with the standard applicable building code and shall have a leak-free, properly insulated, with adequate structural capacity for normal static and dynamic loads, including any high winds or earthquakes which could be reasonably expected in the area.

The Contractor shall maintain, for the whole Contract Period, the Office accommodation including the repair and/or replacement of any item contained therein and in addition shall supply all materials as stipulated therein, including, toilet paper, light bulb, fluorescent tubes, supply of water and electrical power, gas, telephone, office consumable and items and other services as hereinafter specified.

The Contractor shall provide and guard services for the office on a twenty-four (24) hour basis. The total number and schedule of all guard personnel shall be such as to

provide round the clock watch & guard service. The contractor shall also provide appropriate office messengers.

The Contractor shall provide all necessary janitorial services for the entire facilities. The services shall include floor cleaning, servicing and cleaning toilets, window washing, etc. Janitorial services shall be performed on a daily basis with personnel and programming of the work as approved and directed by the Resident Engineer.

The Contractor shall maintain the Office in a neat and attractive manner and provide daily garbage and trash collection and disposal. The Contractor shall maintain all fire extinguishers and air conditioners as recommended by the manufacturer and shall clean/or replace air filters at regular intervals of one month or as required by the manufacturer of these items.

B. Furniture and Equipment for the Resident Engineer Office

The Contractor shall in addition to normal stationery requirements, provide for specified period (s), new furnishings and equipment complying at least to the following list and as per the approval of the Engineer. All furnishings and equipment are for the exclusive use of the Resident Engineer and their staff.

i) Office

Quantity (Nos)		Item
1	-	Light table, (1.60 x 0.80 x 0.75 m high) with in-laid opaque plate glass 1.4 m x 0.60 m x 5 mm and 6 no. fluorescent lamps, 40 watts each, mounted 10 cm under the plate glass.
5	-	Lockable metal filing cabinets for drawings (1.0.x 0.80 x 0.75 m) with 4 no. drawers.
5	-	Metal filing cabinets with 4 no. lockable drawers
As Reqd.	-	Metal waste baskets
5	-	Standard good quality office desks
5	-	Swivel type padded desk chairs with arms and castors
4	-	Executive desk with lockable drawers & glass top
4	-	Executive type upholstered desk chair
2	-	Computer Operator desk with chair and matching computer table.
1	-	Conference table with padded swivel chairs for fifteen (10) persons
10	-	Standard office chairs
2	-	Book cases with two shelves
2	-	Display boards
5	-	Fire ,extinguishers (C02) wall hung
6	-	Standard size staplers

1	-	Heavy duty stapler
2	-	Paper cutters
6	-	Paper hole punches
As Reqd.	-	Pencil sharpeners
4	-	Pencil sharpeners, desk mounted
1	-	Electric water cooler
6	-	Calculators, Casio (Scientific) latest model
1	-	Xerox or equivalent Photocopier including enlarging reduction etc. and automatic voltage stabilizer.
As Reqd	-	Venetian blinds and traverse drapes on all windows.
6	-	Air conditioners split (cooling & heating) 18,000 BTU or as required.
4	-	Plastic trash containers, 50 cm diameter. minimum by 75 cm high
10	-	Construction hard hats
1	-	Binding machine, Model No.212 PB by General Binding Corp or similar.
As Reqd.	-	ZEA 2500 W voltage regulator.
1	-	Facsimile Machine, heavy duty.
2	-	Branded Core 2 Duo computers including required hard and soft wares, laser printer, stabilizer, USB devices, other accessories and unlimited internet services.
2	-	Laser Printer latest model.
1	-	Lap top computer Sony or equivalent latest model of specifications to be approved by the Engineer
2	-	UPS, 1 KVA
1	-	Scanners
1	-	Digital camera Sony or equivalent
4	-	Mobile Phones (Nokia) with accessories (monthly maximum limit of phone bills shall be Rs. 3000 for each phone)
-	-	Generator set of adequate capacity for standby power supply to office

ii) Kitchen

1	-	Single Stainless Steel Sink with Drainboard.
1	-	Electric Refrigerator, 0.40 cu.m capacity with separate freezer compartment, self defrost type.
1	-	Gas stove with 3 burners with gas bottles as required
1	-	Set of kitchen cabinets, lockable, with formica top for working space
2	-	Thermic jugs
2 Set	-	Pots, cups, saucers, water glasses, spoons and serving trays adequate for 20 persons
1 Set	-	Tea towels, w/towel rack and miscellaneous cooking pans, knives, forks, spoons etc. as required
As Reqd.	-	Exhaust fan

iii)	Toilet	4 Nos.
4	-	Water closets, European Style
4	-	Wash basins with hot and cold water and mirror
4	-	Stainless steel toilet paper holders
4	-	Paper towel dispensers
4	-	Mirrors, 40 cm x 50 cm
4	-	Ceramic urinals
4	-	Exhaust fan, W/screen, 1/2 Hp, 220 Volt
4	-	Towel holder

The Contractor shall provide any other item as required by the Resident Engineer for the office facility and maintain the office and equipment in proper manner all to the satisfaction of the Resident Engineer.

All furnishing, fittings, equipments shall remain the property of the Contractor and shall be handed over back to him on completion of the specified time period (s) in Contract Packages and as given in Bill No. 7. The rental building shall be handed over to its owner on Taking Over of the Works.

C. Measurement & Payment

Provisional Sum included and so designated in the Bill of Quantities shall be used on the instructions of the Engineer, in whole or in part, for the cost of providing and maintaining the office accommodation in accordance with Clause 13.5 of Conditions of Contract.

Furniture and equipment provided for the office shall not be paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement
SS-9.2.1(a)	Provide Resident Engineer's Office (Rental)	Provisional Sum (PS)
SS-9.2.1(b)	Provide equipment and furniture for Resident Engineer's Office	Not Payable
SS-9.2.1(c)	Maintain Resident Engineer's Office	Provisional Sum (PS)

9.2.2 RESIDENT ENGINEER'S HOUSING ACCOMMODATION

A. General

The Contractor shall provide the housing accommodation for the whole Contract Period. The housing accommodation shall be provided in a rented building to be hired by the Contractor for this purpose. The building shall be located in a safe and clean area of the city. The location and construction of the rental accommodation shall be approved by the Engineer. The housing accommodation shall have minimum 6-7 bed rooms facility along with attached bath rooms, common room/dinning room, washing facility, kitchen room, store room, servant room, car parking area etc.

The rental accommodation shall have construction in accordance with the standard applicable building code and shall have a leak-free, properly insulated, with adequate structural capacity for normal static and dynamic loads, including any high winds or earthquakes which could be reasonably expected in the area.

The accommodation shall be provided with efficient drainage and sanitation. Housing shall be provided with potable water, gas and electricity available throughout 24 hours of each day.

The Contractor shall maintain, for the whole Contract Period, the residential accommodation including the repair and/or replacement of any item contained therein and in addition shall supply all materials as stipulated therein, including, toilet paper, light bulb, fluorescent tubes, supply of water and electrical power, gas, telephone, consumable items and other services as hereinafter specified. The Contractor shall pay for all utility bills.

The Contractor shall maintain all fire extinguishers and air conditioners as recommended by the manufacturer and shall clean/or replace air filters at regular intervals of one month or as required by the manufacturer of these items.

The Contractor shall provide guard services for the housing on a twenty-four (24) hour basis. The total number and schedule of all guard personnel shall be such as to provide round the clock watch & guard service.

The Contractor shall provide all necessary janitorial services for the entire facilities. The services shall include floor cleaning, servicing and cleaning toilets, window washing, etc. Janitorial services shall be performed on a daily basis with personnel and programming of the work as approved and directed by the Resident Engineer.

The Contractor shall provide, for specified period (s), furnishing and equipment, including curtains, linen, blankets, glassware, cutlery, crockery and kitchen utensils as appropriate. The requirements of furniture and equipment are listed in the schedule given below, which is intended only as a guide to indicate the minimum furniture requirements that will be acceptable.

All furnishings and equipment are for the exclusive use of the Engineer and their staff.

Contractor shall provide any other item as required by the Resident Engineer for the housing facility and maintain the office and equipment in proper manner all to the satisfaction of the Resident Engineer.

All furnishing, fittings, equipments shall remain the property of the Contractor and shall be handed over back to him on completion of the specified 24 months period. The rental building shall be handed over to its owner on Taking Over of the Works.

B. Furniture and Equipment for Resident Engineer Housing

	Quantity
Item	
Single Bed plus mattresses and pillows	6
Double Bed plus mattresses and pillows	1
Wardrobes	7
Chairs	10
Dining table and chairs (to seat 10 persons)	1 Set
Sofa Set (5-Seater)	3 Set
Kitchen cupboards and tables or fitted units	1 Set
Electric Water Coolers	1
Refrigerator large	2
Refrigerator small	1
Air Conditioners	8
Cooking Range	1
Bathroom wall mirror Shelf, medicine cabinet and towel rails	As Reqd
Elect. Gas water heater (geyser)	As Reqd
Glassware, cutlery, crockery, kitchen utensils etc	As Reqd
Towels, bed sheets, blankets/ quilts etc	As Reqd
Television Samsung 32 inch or equivalent	2
Fire Extinguisher	As Reqd
Room Heater (Electrical)	6 Nos.

C. Measurement & Payment

Provisional Sum included and so designated in the Bill of Quantities shall be used on the instructions of the Engineer, in whole or in part, for the cost of providing and maintaining the housing accommodation in accordance with Clause 13.5 of Conditions of Contract.

Furniture and equipment provided for the housing accommodation shall not be paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement
SS-9.2.2(a)	Provide Resident Engineer's Housing(Rental)	Provisional Sum (PS)
SS-9.2.2(b)	Provide equipment and furniture for Resident Engineer's Housing	Not Payable
SS-9.2.2(c)	Maintain Resident Engineer's Housing	Provisional Sum (PS)

9.2.3 ENGINEER'S BASE LABORATORY**A General**

The Contractor shall provide and maintain, for the whole Contract duration, laboratory for the exclusive use of the Engineer and his staff, for testing soils, aggregates, concrete and bituminous materials. The laboratory shall be housed in a rental building, fully equipped with all utilities, furniture, apparatus and fittings appropriate to such use.

The Base Laboratory shall be located adjacent to the Resident Engineer Office or elsewhere as required by the Engineer. It shall consist of a hall and two offices with storage, lavatory and washing facilities. The total area of the laboratory building shall be 250 sq m. The hall shall be divided into bitumen section, soil and aggregates sections and a concrete section.

Outside the laboratory water tanks shall be constructed for curing concrete samples, of a size and location approved by the Engineer.

The laboratory shall be provided with electricity and shall be fully air-conditioned. It shall have a regular and dependable supply of water, gas and electricity available throughout 24 hours of each day. Payment of utility bills such as for electricity, gas, water supply and drainage will be the responsibility of the Contractor.

All rooms shall be provided with exhaust fans, located particularly over fume cupboards and the like.

The water supply shall be maintained by an elevated or pressure tank of adequate capacity.

The lavatory shall be connected to a septic tank of adequate capacity with a 200 mm sanitary pipe and ventilation pipe stack.

The Contractor shall provide qualified materials technicians and qualified laboratory helpers as deemed necessary by the Engineer to assist in operating the laboratory.

The Contractor shall maintain the Engineer's laboratory including the repair and / or replacement of any item. The Contractor shall maintain the laboratory and testing equipment in a satisfactory working condition at all times to enables the Engineer to test the materials and workmanship of the works during construction whenever required, damaged testing equipment shall be replaced by the Contractor and consumable goods shall be supplied in sufficient quantities when ordered by the Engineer for the sole use of testing the construction works. The Contractor shall meet all operating expenses.

The Engineer's Laboratory fittings, equipments including testing equipment and furnishings shall remain the property of the Contractor and shall be handed over back to him after 24 months period. The rental building shall be handed over back to its owner on Taking Over of the Works.

B Sampling

It shall be the responsibility of the Contractor to take samples as required by the Engineer and to provide all necessary transport, labour, tools, containers, wrappings and so forth for uplifting and dispatching samples to the Engineer's Base Laboratory.

C Tests

The Engineer's Base Laboratory shall be equipped to perform the following in-house tests :

TEST DESIGNATION	AASHTO
Moisture content test by oven drying	
Atterberg limits	T-89 & T-90
Moisture density relationship of soils (standard method)	T-99
Moisture density relationship of soils (modified method)	T-180, Method B and D

Specific gravity of soils	T-100
CBR test	T-193
Sieve analysis of soils and aggregate and mineral filler	T-88, T-27 and T-37
Specific gravity and water absorption of fine aggregates	T-84
Specific gravity and water absorption of coarse aggregates	T-85
Unit weight of aggregates	T-19
Los Angeles abrasion test for aggregates	T-96
Chemical tests:	
- Organic impurities for sand in concrete	T-21
- Chlorides and Sulphates in fine aggregates	ASTM-1411
- Potential alkali reactivity test	ASTM-C 289
Amount of material passing No. 200 sieve	T-11
Soundness of aggregates	T-104
Clay lumps and friable particles in aggregates	T-112
Curing concrete compressive test specimens	T-23
Compressive strength of concrete cylinder specimens	T-22
Quality of water to be used in concrete	T-26
Making and curing concrete test specimens in the laboratory	T-126
Plastic fines in graded aggregates and soils by use of sand equivalent test	T-176
Sampling bituminous materials	T-40
Marshall test and loss in stability	T-245
Specific gravity of compacted bituminous mixtures	T-166
Quantitative extraction of bitumen from bituminous paving mixtures	T-164
Viscosity of bitumen	T-20, T-202
Penetration of bitumen	T-49
Flash and fire points	T-48
Solubility of bituminous materials in organic solvents	T-44
Coating and stripping of bitumen-aggregate mixture	T-182
Petrographic analysis	

The Engineer's Base Laboratory shall be equipped to perform the following field tests:

TEST DESIGNATION	AASHTO
In-place density by sand cone method (with 15.25 cms and 30.5 cms cone)	T-191
In-place density of compacted base course containing large sizes of coarse Coarse aggregates	T-181
Sampling fresh concrete	T-141
Concrete slump	T-119
Sampling bituminous materials	T-40
Determining the temperature of bituminous paving mixtures	-
Coring and determination of bulk specific gravity of compacted bituminous Mixtures	T-230, T-166

If any additional testing is required other than mentioned above, the Contractor shall provide all assistance to conduct the test. The cost of all such tests shall be born by the Contractor.

D Furnishing

The Contractor shall provide, for 24 months period, furnishings for the Engineer's Base Laboratory described in the following list to a quality approved by the Engineer. Substitution of type may be made only upon approval of the Engineer.

No.	DESCRIPTION
3	Standard office desks
3	Swivel type padded desk chairs
7	Work tables
15	Standard office chairs
6	Small tables
3	Side racks
3	Metal filing cabinets, 4-drawer
6	Electronic calculators
4	Air conditioners (cooling and heating)
2	Electric water coolers
1	Display board
3	Desk lamps, fluorescent, 20 watts
3	Standard size staplers
1	Heavy duty staplers
2	Paper cutters
2	Paper hole punches
2	Pencil sharpeners
4	Fire extinguishers

E Equipment

The Contractor shall provide new laboratory equipment as noted in the list Equipment for the Engineer's Base Laboratory included herein. The equipment shall be purchased from Messrs Controls, or from equivalent international suppliers, all to the approval of the Engineer.

The Contractor shall submit a complete list of the equipment, apparatus and supplies he proposes to furnish for the Engineer's Laboratory. The list shall include the manufacturer's name and descriptive literature.

Additional equipment and materials shall be supplied by the Contractor at no additional cost as and when required by the Engineer to perform any test relevant to the Works.

F Measurement and Payment

Provisional Sum included and so designated in the Bill of Quantities shall be used on the instructions of the Engineer, in whole or in part, for the cost of providing and maintaining the Engineer's base laboratory in accordance with Clause 13.5 of Conditions of Contract.

Furniture and equipment provided for the housing accommodation shall not be paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement

SS-9.2.3(a)	Provide Engineer's Base laboratory (Rental)	Provisional Sum (PS)
SS-9.2.3(b)	Provide equipment and furniture for Engineer's Base laboratory	Not Payable
SS-9.2.3(c)	Maintain Engineer's Base laboratory	Provisional Sum (PS)

EQUIPMENT FOR THE ENGINEER'S BASE LABORATORY

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
A.	GENERAL EQUIPMENT			
1	Laboratory oven, capacity 220 litre	UNE-600	Each	1
2	Laboratory oven, capacity 100 litre	10-D1390	Each	1
3	Hot plate, maximum temperature 350°C	10-D1405/A	Each	1
4	Gas burner, two flames	999-G/S	Each	1
5	Bunsen burner with tripod	86D/1/1420	Each	1
6	Heavy duty straight spring scale	11-D695	Each	1
7	Heavy duty balance, 20 kg.	11-D610	Each	1
8	Triple beam balance, 2,610 grams	11-D605	Each	1
9	Cent-O-Gram balance, 311 grams	11-D600	Each	2
10	Platform balance 150 kg	11-D690/A	Each	1
11	Electronic precision balance	11-D629/Z	Each	1
12	Digital top pan balance 30 kg x 1 gram capacity with cradle	11-D612/A, D627/C	Each	1
13	Wall clock	-	Each	1
14	Stop watch	86-D1231	Each	1
15	Vernier caliper	86-D1652	Each	1
16	Thermometer, general, 0°C - 200°C	86-D1202		2
17	Maximum - minimum thermometer	86-D1215	Each	1
18	Sampling tools, complete set	40-T10/A	Each	1
19	Tongs	86-D1455	Each	2
20	Desicator	86-D1110	Each	1
21	Beaker, pyrex, 250 ml	86-D1073	Each	2
22	Beaker, pyrex, 600 ml	86-D1074	Each	2
23	Beaker, pyrex, 1,000 ml	86-D1075	Each	2
24	Funnel, 250 ml	86-G001	Each	2
25	Funnel, 500 ml	86-G002	Each	2
26	Volumetric flask, 100 ml	86-D1059	Each	2
27	Volumetric flask with stopper, 250 ml	86-D1060	Each	2
28	Volumetric flask with stopper, 500 ml	86-D1061	Each	2
29	Volumetric bottle flask, 250 ml	86-D1050	Each	2
30	Volumetric bottle flask, 500 ml	86-D1051	Each	2
31	Wash bottle, 100 ml	86-D1535	Each	2
32	Wash bottle, 250 ml	86-D1536	Each	2
33	Wash bottle, 500 ml	86-D1537	Each	2
34	Specific gravity bottles 100 ml (86D-1127)	86-D1003	Each	1
35	Graduated cylinder, 100 ml	86-D1004	Each	2
36	Graduated cylinder, 250 ml	86-D1006	Each	2

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
37	Graduated cylinder, 1,000 ml	86-D1092	Each	2
38	Reagent bottle stoppered, 2 litre	86-D1332	Each	2
39	Aluminium cans with cover, 2" diameter	86-D1333	L.S	*
40	Aluminium cans with cover, 3" diameter	86-D1334	L.S	*
41	Scoop	86-D1602	Each	2
42	Brush, fine	86-D1671	Each	1
43	Wire brush, coarse	86-D1670	Each	1
44	Wire brush, fine	86-D1673	Each	1
45	Bucket, 12 litre		Each	2
46	Trolley	86-D1703	Each	1
47	Shovel, large		Each	1
48	Pickaxe		Each	1
49	Sample splitter, coarse	15-D437	Each	1
50	Sample splitter, fine	15-D433	Each	1
51	Sieve shaker for 8" diameter sieve, motorised	15-D407	Each	1
52	Tin pan/tray, 12" x 12" x 2"		Each	4
53	Tin pan/tray, 16" x 16" x 3"		Each	4
54	Tin pan/tray, 24" x 16" x 3"		Each	4
55	Tin pan/tray, 20" x 16" x 4"		Each	4
56	Mortar porcelain, 200 mm diameter with rubber covered pestle	15-D1180	Each	1
B.	COARSE AND FINE AGGREGATES SIEVE ANALYSIS			
	Sieve set 8" diameter:			
1	1 inch	15-D110/2	Each	3
2	3/4 inch	15-D112/2	Each	2
3	1/2 inch	15-D115/2	Each	2
4	3/8 inch	15-D117/2	Each	2
5	No. 4 (4.74 mm)	15-D122/2	Each	2
6	No. 8 (2.36 mm)	15-D126/2	Each	2
7	No. 10 (2.00 mm)	15-D127/2	Each	3
8	No. 16 (1.18 mm)	15-D130/2	Each	2
9	No. 30 (0.60 mm)	15-D134/2	Each	2
10	No. 40 (0.425 mm)	15-D136/2	Each	3
11	No. 50 (0.300 mm)	15-D138/2	Each	2
12	No. 80 (0.180 mm)	15-D141/2	Each	1
13	No. 100 (0.150 mm)	15-D142/2	Each	2
14	No. 200 (0.075 mm)	15-D146/2	Each	3
15	Wet washing No. 200	15-D160/2	Each	3
	Sieve set 12" diameter:			

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
16	3 inch (75 mm)	15-D102/3	Each	2
17	2 1/2 inch (63 mm)	15-D103/3	Each	2
18	2 inch (50 mm)	15-D105/3	Each	2
19	1 1/2 inch (38 mm)	15-D107/3	Each	2
20	1 inch (25 mm)	15-D110/3	Each	2
21	3/4 inch (19 mm)	15-D112/3	Each	2
22	1/2 inch (12.5 mm)	15-D115/3	Each	2
23	3/8 inch (9.5 mm)	15-D117/3	Each	2
24	No. 4 (4.74 mm)	15-D122/3	Each	2
	Sieve set 18" diameter:			
25	3 inch (75 mm)	15-D102/45	Each	2
26	2 1/2 inch (63 mm)	15-D103/45	Each	2
27	2 inch (50 mm)	15-D105/45	Each	2
28	1 1/2 inch (38 mm)	15-D107/45	Each	2
29	1 inch (25 mm)	15-D110/45	Each	2
30	3/4 inch (19 mm)	15-D112/45	Each	2
31	1/2 inch (12.5 mm)	15-D115/45	Each	2
32	3/8 inch (9.5 mm)	15-D117/45	Each	2
33	No. 4 (4.74 mm)	15-D122/45	Each	2
34	Pan	15-D152/2 /3/45	Each	2
35	Cover	15-D152/2 /3/45	Each	2
36	Large Capacity Sample Splitter	15-D430	Each	1
37	Sample Splitter	15-D437	Each	1
C.	ATTERBERG LIMITS			
1	Liquid limit test set with all accessories	22-T32/AP	Each	1
2	Mixing Dish	86-D1172	Each	2
3	Moisture Tin	86-D1330	Each	10
4	Spatula	86-D1630	Each	2
5	Plastic limit test set with all accessories	22-T41	Each	1
D.	SAND EQUIVALENT			

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
1	Apparatus complete	22-T50/A	Set	1
E.	COARSE AND FINE AGGREGATE UNIT WEIGHT			
1	Density basket, brass	11-D612	Each	1
2	Sand absorption cone and tamper	47-D440	Each	1
3	Pycnometers	47-D441	Each	2
4	Specific gravity bottle	86-D1125	Each	1
5	Specific gravity bottle	86-D1126	Each	1
6	Specific gravity bottle	86-D1127	Each	1
F.	ABRASION			
1	Los Angeles abrasion machine with abrasion charges set	48-D500	Each	1
G.	COARSE AND FINE AGGREGATE SOUNDNESS			
1	Distilled water	-	L.S.	*
2	Sodium sulphate solution	-	L.S.	*
H	AGREEGATE FLAKINESS AND ELONGATION			
1	Flakiness sieve test set	47-D415		1
2	Thickness Gauge	47-D540		1
3	Length Gauge	46-D541		1
I.	MODIFIED COMPACTION			
1	Straight edge	34-T99	Each	1
2	Scoop	86-D1601	Each	1
3	Scoop	86-D1602	Each	1
4	Mixing spoons	35-T143	Each	1
5	Sample ejector	16-T80	Each	1
6	Modified compaction hammer, 10 lbs	33-T76	Each	2
7	Modified compaction mould, 6" diameter	33-T71	Each	2
8	Modified compaction mould, 4" diameter	33-T70	Each	2
9	Preparation knife	Local	Each	1
10	Wooden hammer	Local	Each	1
11	Spatula	Local	Each	1
12	Mixing tray, 24" x 24" x 3"	Local	Each	*
J.	LABORATORY CBR			
1	Soaking, tank 60" x 120" x 24"	Local	Each	1
2	CBR mould, 6" diameter with collars, plate, screws	34-T90	Each	9
3	Filter Paper	86-D1800	L.S.	*

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
4	Swell Plates	34-T92	Each	9
5	Surcharge weights	34-T94	Each	18
6	Surcharge weights, slotted	34-T95	Each	2
7	Tripod attachment	34-T93	Each	9
8	Dial indicator	86-D1256	Each	9
9	Spacer, disc	34-T91	Each	2
10	CBR loading press, hydraulic, motorized	34-T105	Each	1
11	Proving ring, 2,000 lbs	82-T1002	Each	1
12	Proving ring, 6,000 lbs	82-T1007	Each	1
13	Proving ring, 13,000 lbs	82-T1009	Each	1
K.	FIELD DENSITY			
1	6 inches sand density cone apparatus (Complete Set)	35-T130	Each	3
2	Spoon	Local	Each	2
3	Plastic bags	Local	L.S	*
4	Chisel, 12"	Local	Each	2
5	Hammaer, 2.5 lbs	Local	Each	2
6	Field balance	11-D608	Each	2
7	Speedy moisture tester	19-T24	Each	2
8	Nuclear density guage, Troxler XFL		Each	1
9	Sieve No. 30 (0.60 mm)	15-D136/6	Each	2
L.	BITUMEN			
1	Bitumen penetration test, penetrometer (Complete Set)	81-B100/A	Set	1
M.	ASPHALT			
1	Marshall stability compressive machine (with all Accessory)	76-B29A	Each	1
2	Marshall compaction hammer	76-B58	Each	1
3	Marshall specimen mould holder	76-B56/B	Each	1
4	Marshall breaking head	76-B33	Each	1
5	Marshall flow mete	76-B34	Each	1
6	Marshall mixing apparatus	16-B72	Each	1
7	Water bath (thermostatic) controlled to 60°C	76-B66/S	Each	1
	Bituminous extractor apparatus	75-B23/A		
1	Filter disc	75-B22/1	L.S.	*
2	Mixing bowl (steel)	75-B22/2	Each	1
3	Asphalt oven	81-B160	Each	1
4	Vacuum pycnometer	75-D1122	Each	1
5	Extractor for slability mould	76-B57/B5	Each	1
6	Stability mould with collar	76-B57	Each	6

SR. No.	EQUIPMENT DESCRIPTION	MODEL No. / Make	UNIT	QTY
7	Compaction pedestal	76-B59	Each	1
8	Hammer Guide	76-B59/1	Each	1
9	Pavement core drill with 4" diameter core	83-D202	Each	1
10	Core bit, 4" diameter	83-D322/1	Each	4
11	Expend Set	83-D312/1	Drum	*
12	Thermometer, metallic 350°C		Each	4
13	Hubbard-Carmick specific gravity bottle	86-D1115	Each	1
M.	CONCRETE AND CEMENT			
1	Compressive strength machine, heavy duty, 2000 KN	50-C52/B	Each	1
2	Steel scale	-	Each	2
3	Curing tank with temperature control	-	Each	1
4	Cement mould brush	-	Each	2
5	Laboratory concrete mixer	55-C196/1	Each	1
6	Concrete vibrator	55-C162/A	Each	1
7	Concrete tray	86-D1305/1	Each	*
8	Air meter complete	54-C170/D	Set	1
9	Cylinder mould, heavy duty, 6" diameter	54-C118/D	Each	9
10	Cylinder capping apparatus	54-C121/21	Each	1
11	Concrete capping compound	54-C121/1	Kg	*
12	Laboratory warming pot	54-C121/4	Each	1
13	Slump test cone	54-C149/A	Set	2
14	Tamper	55-C140	Each	1
15	Vibrating table	55-C161	Each	1
16	Concrete micrometer		Each	1
17	Vicat apparatus Complete set	63-L28/1	Set	1
18	Steel straight edge		Each	2
19	Hand gloves, rubber		Pair	*
20	Trowel triangular blade		Each	2
21	Cement cube mould	65-L80/A	Each	2

* As per requirement

9.2.4 ENGINEER'S VEHICLES

A General

The Contractor shall provide, for specified times period (s) as per Bill No. 7, on instruction of the Engineer and make available at all times for the exclusive use of the Engineer and his staff, the following new vehicles. Vehicles details are provided in Bill No. 7, as specified in contract packages.

The Contractor shall provide safe, experienced and competent drivers with the approval of the Engineer for all the vehicles. Each driver shall be responsible for the vehicle allocated to him for the duration of the Contract. The Contractor shall promptly replace any driver who, in the Engineer's opinion, is not satisfactory.

The Contractor shall provide vehicle within 15 days of receipt of such Engineer's instruction. For failure to provide said vehicles within the prescribed period of time, the Contractor will pay penalties to the Employer at the rate of Rs. 2,000/= per day for each vehicle not provided.

B Maintenance of Vehicle:

The Vehicles shall be registered, taxed, comprehensively insured, fuelled, repaired, serviced and maintained by the Contractor for the duration of the Contact in the following manner:

- i) Temporary replacement of vehicles if any vehicle be not in a road worthy condition until such vehicle is repaired and returned for use.
- ii) Maintenance, cleaning, repairs and servicing of the vehicles according to manufacturers recommendations and garaging, replacement of the tyres, batteries etc. whenever necessary and directed by the Engineers.
- iii) Supply of necessary POL, Gas etc. (for project's use only).
- iv) Procurement and maintaining the validity of vehicles registration and insurance policies. Comprehensive insurance policy including theft, fire (covering a qualified driver authorized by the Engineer together with authorized passenger's liability cover). The policies and license shall be valid till the end of the project.
- v) If the Contractor fails to maintain the vehicles to the satisfaction of the Engineer or otherwise fails to comply fully with this section, the Engineer may withhold payment under this section, as he considers necessary. The Contractor shall bear all costs that may arise including delays due to failure of the Contractor to comply with this section.

C Ownership Of Vehicles After Completion:

The Engineer's vehicles shall remain the property of the Contractor and shall be handed over back to him at the end of specified period (s).

D Measurement & Payment:

Providing the vehicles and drivers in accordance with the above specifications shall not be measured and paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Provisional Sum included and so designated in the Bill of Quantities shall be used on the instruction of the Engineer, in whole or in part, for the cost of maintaining and servicing the Engineer's Vehicles in accordance with Clause 13.5 of the Contract Conditions.

Pay Item No.	Description	Unit of Measurement

SS-9.2.4(a)	Provide Engineer's Vehicles	
	Vehicles as per Bill No. 7	Not Payable
SS-9.2.4(b)	Maintenance of Engineer's Vehicles	
	Vehicles as per Bill No. 7	PS (Provisional Sum)

9.3 ENGINEER'S SITE FACILITIES

9.3.1 FIELD ACCOMMODATION

A. GENERAL

The Contractor shall provide, for the whole contract duration, field office cum residential accommodation for the Engineer's field staff in a rented building to be hired by the Contractor for this purpose. The location and construction of the rental accommodation shall be approved by the Engineer. The accommodation shall comprise of an office room, three residential rooms, 2 toilets and a kitchen of appropriate sizes.

The rental accommodation shall have sound, adequate weather proof construction with adequate structural capacity and effective drainage and sanitation.

The Contractor shall maintain, for the whole contract duration, the field accommodation including the repair and/or replacement of any item contained therein and in addition shall supply all materials as stipulated therein, including light bulb, fluorescent tubes, supply of water and electrical power, gas, telephone, office consumable and items and other services as hereinafter specified. The Contractor shall pay for all the utility bills.

The Contractor shall provide all necessary janitorial services for the facility. The services shall include floor cleaning, servicing and cleaning toilets, window washing, etc. Janitorial services shall be performed on a daily basis.

The Contractor shall maintain the accommodation in a neat and attractive manner and provide daily garbage and trash collection and disposal.

B FURNITURE AND EQUIPMENT FOR THE FIELD ACCOMMODATION

The Contractor shall, in addition to normal stationery requirements, provide suitable furnishings and equipment complying at least to the following list and as per the approval of the Engineer. All furnishings and equipment are for the exclusive use of the Engineer's field staff.

Quantity (Nos)	Item
i) Office	
1	- Lockable metal filing cabinets for drawings (1.0.x 0.80 x 0.75 m) with 4 no. drawers.
1	- Metal filing cabinets with 4 no. lockable drawers
As Reqd.	- Metal waste baskets
3	- Standard good quality office desks
6	- Standard office chairs
1	- Display boards
3	- Standard size staplers
1	- Heavy duty stapler

3	-	Paper hole punches
As Reqd.	-	Pencil sharpeners
1	-	Pencil sharpeners, desk mounted
3	-	Calculators, Casio (Scientific) latest model
3	-	Plastic trash containers, 50 cm diameter. minimum by 75 cm high
6	-	Construction hard hats
1	-	Digital camera Sony or equivalent
2	-	Mobile Phones (Nokia) with accessories (monthly maximum limit of phone bills shall be Rs. 2000 for each phone)
-	-	Generator set of adequate capacity for standby power supply

ii) Kitchen

1	-	Single Stainless Steel Sink with Drainboard.
1	-	Electric Refrigerator, 0.40 cu.m capacity with separate freezer compartment, self defrost type.
1	-	Gas stove
2	-	Thermic jugs
1 Set	-	Pots, cups, saucers, water glasses, spoons and serving trays adequate for 10 persons
1 Set	-	Glassware, cutlery, crockery, kitchen utensil etc.
1.	-	Exhaust fan

iii) Toilet 2 Nos.

2	-	Water closets, Eastern Style
2	-	Wash basins with mirror
2	-	Exhaust fan
	-	Towel holder

iv) Residence

3	Single bed with mattress and pillow
3	Wardrobe
3	Chairs
3	Table
As Reqd.	Linen, blankets, towel, curtains etc
2	Air conditioners
1	TV 26" and Refrigerator

The Contractor shall maintain the facility in proper manner all to the satisfaction of the Engineer/ Resident Engineer.

All furnishing, fittings, equipments shall remain the property of the Contractor on completion of the Works. The rental building shall be handed over to its owner.

C MEASUREMENT & PAYMENT

Providing, furnishing, equipping and maintaining the field accommodation shall not be measured and paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement

SS-9.3.1(a)	Provide, equip and furnish Field Accommodation	Not Payable
SS-9.3.1(b)	Maintain Field Accommodation	Not Payable

9.3.2 ENGINEER'S FIELD LABORATORY**A GENERAL**

The Contractor shall provide and maintain field laboratory for the whole contract duration for the exclusive use of the Engineer's field staff for testing. The field laboratory shall be housed in a rented room of size as required for keeping the field testing equipment and performing the required testing at site. The field laboratory shall be located adjacent to the field accommodation. and fully equipped with all utilities, furniture, apparatus and fittings appropriate to such use.

Outside the laboratory water tanks shall be constructed for curing concrete samples.

The field laboratory shall have a regular and dependable supply of water, gas and electricity available throughout 24 hours of each day. Payment of utility bills such as for electricity, gas, water supply and drainage will be the responsibility of the Contractor.

The Contractor shall provide qualified materials technicians and qualified laboratory helpers as deemed necessary by the Engineer to assist in operating the laboratory.

The Contractor shall maintain the field laboratory including the repair and / or replacement of any item. The Contractor shall maintain the laboratory and testing equipment in a satisfactory working condition at all times to enables the Engineer's staff to test the materials and workmanship of the works during construction. whenever required, damaged testing equipment shall be replaced by the Contractor

and consumable goods shall be supplied in sufficient quantities when ordered by the Engineer for the sole use of testing the construction works. The Contractor shall meet all operating expenses.

The Contractor shall provide for the Engineer's Field Laboratory necessary furnishings like chairs, working tables, cabinets etc.

The Field Laboratory fittings, equipments including testing equipment and furnishings shall remain the property of the Contractor on completion of the works. The rental building shall be handed over back to its owner.

B Sampling

It shall be the responsibility of the Contractor to take samples as required by the Engineer's staff and to provide all necessary transport, labour, tools, containers, wrappings and so forth for uplifting and dispatching samples to the Engineer's Field or Base Laboratory.

C Tests

The Engineer's Field Laboratory shall be equipped to perform the following in-house tests :

TEST DESIGNATION	AASHTO
Moisture content test by oven drying Atterberg limits	T-89 & T-90
Moisture density relationship of soils (modified method)	T-180, Method B and D
Sieve analysis of soils and aggregate and mineral filler	T-88, T-27 and T-37
In-place density by sand cone method (with 15.25 cms and 30.5 cms cone)	T-191
Concrete slump	T-119

If any additional testing is required other than mentioned above, the Contractor shall provide all assistance to conduct the test. The cost of all such tests shall be born by the Contractor.

D Equipment

The Contractor shall provide new laboratory equipment as noted in the list Equipment for the Engineer's Field Laboratory included herein. The equipment shall be purchased from Messrs Controls, or from equivalent international suppliers, all to the approval of the Engineer.

The Contractor shall submit a complete list of the equipment, apparatus and supplies he proposes to furnish for the Engineer's Field Laboratory. The list shall include the manufacturer's name and descriptive literature.

Additional equipment and materials shall be supplied by the Contractor at no additional cost as and when required by the Engineer to perform any test relevant to the Works.

EQUIPMENT FOR THE ENGINEER'S FIELD LABORATORY

SR. No.	EQUIPMENT DESCRIPTION	CONTROLS MODEL No.	UNIT	QTY
A.	GENERAL EQUIPMENT			
1	Laboratory oven, capacity 100 litre	10-D1390	Each	1
2	Gas burner, two flames	999-G/S	Each	1
3	Heavy duty balance, 20 kg.	11-D610	Each	1
4	Triple beam balance, 2,610 grams	11-D605	Each	1
5	Cent-O-Gram balance, 311 grams	11-D600	Each	2
6	Platform balance 150 kg	11-D690/A	Each	1
7	Electronic precision balance	11-D629/Z	Each	1
8	Digital top pan balance 30 kg x 1 gram capacity with cradle	11-D612/A, D627/C	Each	1
9	Graduated cylinder, 100 ml	86-D1004	Each	2
10	Aluminium cans with cover, 2" diameter	86-D1333	L.S	*
11	Scoop	86-D1602	Each	2
12	Brush, fine	86-D1671	Each	1
13	Wire brush, coarse	86-D1670	Each	1
14	Shovel, large		Each	1
15	Sieve shaker for 8" diameter sieve, motorised	15-D407	Each	1
16	Tin pan/tray, 12" x 12" x 2"		Each	4
17	Tin pan/tray, 16" x 16" x 3"		Each	4
18	Tin pan/tray, 24" x 16" x 3"		Each	4
19	Tin pan/tray, 20" x 16" x 4"		Each	4
20	Mortar porcelain, 200 mm diameter with rubber covered pestle	15-D1180	Each	1
B.	COARSE AND FINE AGGREGATES SIEVE ANALYSIS			
	Sieve set 8" diameter:			
1	1 inch	15-D110/2	Each	3
2	3/4 inch	15-D112/2	Each	2
3	1/2 inch	15-D115/2	Each	2

SR. No.	EQUIPMENT DESCRIPTION	CONTROLS MODEL No.	UNIT	QTY
4	3/8 inch	15-D117/2	Each	2
5	No. 4 (4.74 mm)	15-D122/2	Each	2
6	No. 8 (2.36 mm)	15-D126/2	Each	2
7	No. 10 (2.00 mm)	15-D127/2	Each	3
8	No. 16 (1.18 mm)	15-D130/2	Each	2
9	No. 30 (0.60 mm)	15-D134/2	Each	2
10	No. 40 (0.425 mm)	15-D136/2	Each	3
11	No. 50 (0.300 mm)	15-D138/2	Each	2
12	No. 80 (0.180 mm)	15-D141/2	Each	1
13	No. 100 (0.150 mm)	15-D142/2	Each	2
14	No. 200 (0.075 mm)	15-D146/2	Each	3
15	Wet washing No. 200	15-D160/2	Each	3
	Sieve set 12" diameter:			
16	3 inch (75 mm)	15-D102/3	Each	2
17	2 1/2 inch (63 mm)	15-D103/3	Each	2
18	2 inch (50 mm)	15-D105/3	Each	2
19	1 1/2 inch (38 mm)	15-D107/3	Each	2
20	1 inch (25 mm)	15-D110/3	Each	2
21	3/4 inch (19 mm)	15-D112/3	Each	2
22	1/2 inch (12.5 mm)	15-D115/3	Each	2
23	3/8 inch (9.5 mm)	15-D117/3	Each	2
24	No. 4 (4.74 mm)	15-D122/3	Each	2
C.	ATTERBERG LIMITS			
1	Liquid limit test set with all accessories	22-T32/AP	Each	1
2	Mixing Dish	86-D1172	Each	2
3	Moisture Tin	86-D1330	Each	10
4	Spatula	86-D1630	Each	2
5	Plastic limit test set with all accessories	22-T41	Each	1
D.	MODIFIED COMPACTION			
1	Straight edge	34-T99	Each	1
2	Scoop	86-D1601	Each	1
3	Scoop	86-D1602	Each	1
4	Mixing spoons	35-T143	Each	1
5	Sample ejector	16-T80	Each	1
6	Modified compaction hammer, 10 lbs	33-T76	Each	2
7	Modified compaction mould, 6" diameter	33-T71	Each	2
8	Modified compaction mould, 4" diameter	33-T70	Each	2
9	Preparation knife	Local	Each	1
10	Wooden hammer	Local	Each	1

SR. No.	EQUIPMENT DESCRIPTION	CONTROLS MODEL No.	UNIT	QTY
11	Spatula	Local	Each	1
12	Mixing tray, 24" x 24" x 3"	Local	Each	*
E.	FIELD DENSITY			
1	6 inches sand density cone apparatus (Complete Set)	35-T130	Each	3
2	Spoon	Local	Each	2
3	Plastic bags	Local	L.S	*
4	Chisel, 12"	Local	Each	2
5	Hammaer, 2.5 lbs	Local	Each	2
6	Field balance	11-D608	Each	2
7	Speedy moisture tester	19-T24	Each	2
8	Nuclear density guage, Troxler XFL		Each	1
9	Sieve No. 30 (0.60 mm)	15-D136/6	Each	2
F.	CONCRETE AND CEMENT			
1	Compressive strength machine, heavy duty, 2000 KN	50-C52/B	Each	1
2	Steel scale	-	Each	2
3	Curing tank with temperature control	-	Each	1
4	Cement mould brush	-	Each	2
5	Laboratory concrete mixer	55-C196/1	Each	1
6	Concrete vibrator	55-C162/A	Each	1
7	Concrete tray	86-D1305/1	Each	*
8	Air meter complete	54-C170/D	Set	1
9	Cylinder mould, heavy duty, 6" diameter	54-C118/D	Each	9
10	Cylinder capping apparatus	54-C121/21	Each	1
11	Concrete capping compound	54-C121/1	Kg	*
12	Laboratory warming pot	54-C121/4	Each	1
13	Slump test cone	54-C149/A	Set	2

E MEASUREMENT AND Payment

Providing, furnishing, equipping and maintaining the field laboratory shall not be measured and paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement
SS-9.3.2(a)	Provide, equip and furnish Engineer's Field Laboratory	Not Payable

SS-9.3.2(b)	Maintain Engineer's Field Laboratory	Not Payable
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9.3.3 VEHICLES FOR FIELD STAFF

A GENERAL

The Contractor shall provide, for the whole contract duration, the following new vehicle for the exclusive use of the Engineer's field staff:

- Suzuki Alto VXR (M) CNG or equivalent, new and latest model, Air Conditioned and fully equipped as per manufacturer's Specifications. 1 No.

The Contractor shall provide safe, experienced and competent driver with the approval of the Engineer for the vehicle. Driver shall be responsible for the vehicle allocated to him for the duration of the Contract. The Contractor shall promptly replace any driver who, in the Engineer's opinion, is not satisfactory.

The Contractor shall provide vehicle within 15 days of receipt of such Engineer's instruction. For failure to provide said vehicle within the prescribed period of time, the Contractor will pay penalties to the Employer at the rate of Rs. 2,000/= per day.

B MAINTENANCE OF VEHICLE:

The Vehicle shall be registered, taxed, comprehensively insured, fuelled, repaired, serviced and maintained by the Contractor for the duration of the Contract in the following manner:

Temporary replacement of vehicle if vehicle be not in a road worthy condition until such vehicle is repaired and returned for use.

Maintenance, cleaning, repairs and servicing of the vehicle according to manufacturers recommendations and garaging, replacement of the tyres, batteries etc. whenever necessary and directed by the Engineer.

Supply of necessary POL, Gas etc. (for project's use only).

Procurement and maintaining the validity of vehicle registration and insurance policies. Comprehensive insurance policy including theft, fire (covering a qualified driver authorized by the Engineer together with authorized passenger's liability cover). The policies and license shall be valid till the end of the project.

If the Contractor fails to maintain the vehicle to the satisfaction of the Engineer or otherwise fails to comply fully with this section, the Engineer may withhold payment under this section, as he considers necessary. The Contractor shall bear all

costs that may arise including delays due to failure of the Contractor to comply with this section.

C OWNERSHIP OF VEHICLES AFTER COMPLETION:

The vehicle shall remain the property of the Contractor and handed over back to him on the completion of the works.

D MEASUREMENT & PAYMENT:

Providing and maintaining the Vehicles shall not be measured and paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement

SS-9.3.3(a)	Provide Vehicle for Engineer's field staff Suzuki Alto VXR (M)CNG (1 No.)	Not Payable
SS-9.3.3(b)	Maintenance of Engineer's field staff Vehicle Suzuki Alto VXR (M) CNG (1 No)	Not Payable

9.3.4 ENGINEER'S SURVEY EQUIPMENT

A GENERAL

The Contractor shall provide and maintain, for the whole contract duration, survey equipment for the use of the Engineer and his Staff. All the survey equipment shall be new and shall be maintained throughout the Contract duration and replaced by the Contractor free of charge in case of damage or loss howsoever caused. The Contractor shall also arrange calibration of all surveying instruments after every three months.

After the completion of the Works the survey equipment shall remain the property of the Contractor and shall be handed over back to him.

B Equipment

The Contractor shall provide and maintain the following survey equipment:

No.	DESCRIPTION
1	<p>Total Station survey units complete</p> <p>SOkkia SET2010 or Equivalent</p> <p>.5” Reading 2” Accuracy, Range with Prism 3.5 km complete with:</p> <ul style="list-style-type: none">– Built in Data lodger– Main Unit with WA-type Tribrach– BDC 35 Rechargeable Battery X2– CDC 40 Quick charger– 5000 points Built in memory + SDC Memory card (128k byte)– CPT Tubular Compass– Sunshade, Lens Cap, Plumbbob,– Vinyl Cover, Tool Kit, Cable, Belt,– Basic Operation Manual, Carrying Case– Precision Wooden Tripod
2	Automatic Level complete with tripod AL 32 A or equivalent
2	Aluminium Telescopic Tripod Sokkia PFA1 or equivalent

- 4 Levelling Staff (local manufacture)
- 2 Range Pole Level Sokkia AP61L or equivalent
- 3 Steel measuring tape, 50 m long
- 4 Steel measuring tape, 20 m long
- 10 Steel measuring tape, 3 m long

C Consumables

The Contractor shall provide adequate supplies of expendable materials, such as pencils, rubbers, inks, notebooks, drawing paper, survey pegs, brushes and paints as required by the Engineer.

D Measurement and Payment

Providing and maintaining the Survey equipment shall not be measured and paid separately and shall be deemed to be included in the quoted rates of the Contractor for other items.

Pay Item No.	Description	Unit of Measurement
SS-9.3.4(a)	Provide Survey Equipment	Not Payable
SS-9.3.4(b)	Maintain Survey Equipment	Not Payable