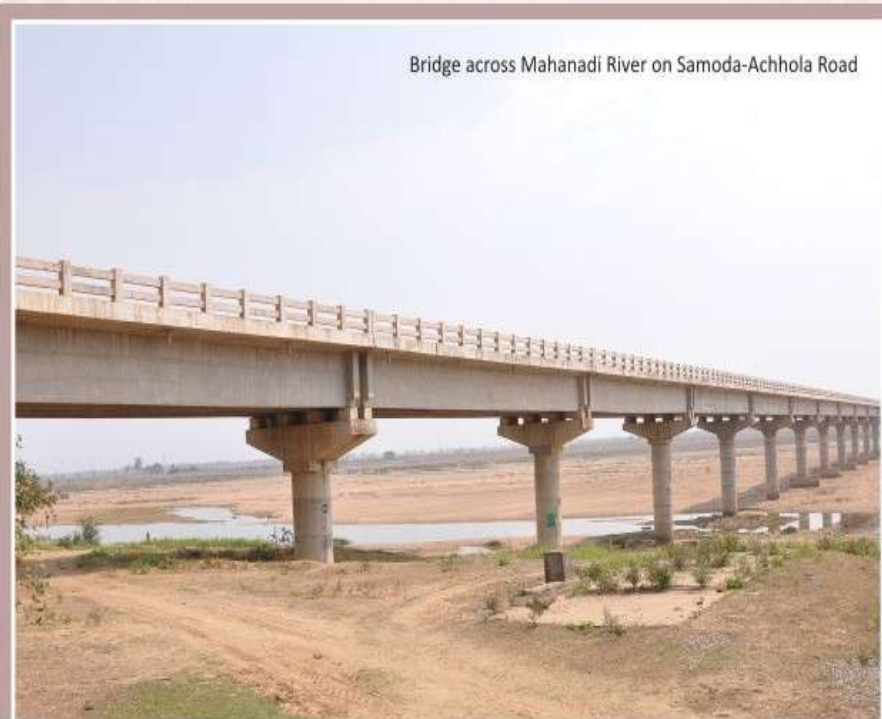




GOVERNMENT OF CHHATTISGARH
PUBLIC WORKS DEPARTMENT

SCHEDULE OF RATES
FOR **BRIDGE WORKS**



With Effect From 1ST January, 2015

Issued by
ENGINEER-IN-CHIEF
P.W.D., CHHATTISGARH, RAIPUR



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PUBLIC WORKS DEPARTMENT CHHATTISGARH (RAIPUR)**

No. 1639/WORK

Dated : 27/12/2014

SCHEDULE OF RATES FOR BRIDGE WORKS

PREAMBLE

The **Schedule of rates** published by PWD is an important document, as this does not only serve as an useful tool for estimation, evaluation & execution of govt. works by P.W.D. people - but also referred to as an authority by other govt., semi government & private entities like builders, architects and consultants.

The last schedule of rates (SOR) for Bridge works was published in 2013, and was in force from 15-05-2013. Since then, the department has registered considerable changes in the prices of labour, materials, POL and machineries. Apart from it, the MORT&H has revised the **Specifications for Road & bridge Works** (February 2013). The Indian road congress has also ammended various codes. In the light of all these, the prevailing SOR needed revision .

It is a matter of great pleasure that the new **SOR For Bridge Works** is Coming in to force from 01st January 2015.

This S.O.R. has been prepared on the basis of the "**Standard Data Book for Analysis of Rates**" of Ministry of Road Transport & Highway, published by Indian Road Congress. Few of items which do not find place in the Standard Data Book for analysis of rates have been included in this S.O.R. as these are required and were provided in the old S.O.R.

Some items have been modified in their nomenclature as per requirements. The description of the items is kept according to MORT&H "**Specification of Road and Bridge works**" (Fifth Revision).

Standard tables given in the MORT&H Specification of Road and Bridge works are annexed with the S.O.R. so as to facilitate engineers during execution.

Considerable efforts have been made to incorporate the above changes, but there always remain scope for betterment. Suggestions in this regard shall be highly welcomed.

Though every possible care has been taken in preparing this SOR but in a work like this, the chances of typographical and other errors can not be ruled out. It will be appreciated, if these could be brought to notice.

I sincerely express my gratitude and thanks to Shri K.K. Pipri, Chief Engineer, Bridge Zone Raipur who has taken immense pain in inspiring and guiding his entire team for making this document comprehensive and unique.

I would also commend S/Shri S.K. Kori (Superintendent Engineer), G.P. Pawar (Executive Engineer), Y.K. Sonkar (Executive Engineer) & C.K. Pandey (Assistant Engineer) for their continuous untiring efforts in the above mission.

The work has been made possible with the sincere efforts of several persons & institutions. It is not possible here to name them all, but we sincerely acknowledge with thanks the help & cooperation extended by them.

This **SOR** is available on the department website (www.cg.nic.in/pwdraipur) also.

Raipur
27/12/2014


Er. D.K. Pradhan
E-in-C PWD, Chhattisgarh

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GENERAL NOTES

1)	<u>DEFINITIONS</u>	
a)	Major Bridge :	Having a total length of above 60 M. measured along the centre line of the bridge between inner faces of the dirt walls.
b)	Minor Bridge :	Having a total length of upto 60 M measured along the centre line of the bridge between inner faces of the dirt walls.
c)	Culverts :	Having a total length 6 M. or less between the inner faces of the dirt walls or extreme vents way boundaries measured at right angles thereof.
2)	<u>SPECIFICATIONS</u>	
i)	The specifications of works shall be carried out as per 5th revision of "Specifications for Road and Bridge works" (Ministry of Road Transport & Highway) - subject to such changes as are incorporated in the wording of the items and notes below. The work will be governed by the design considerations and specifications contained in I.R.C. codes of practice for Road/Bridges issued upto the date of receipt of tender.	
ii)	The materials of construction shall be governed as per relevant I.S. Codes.	
iii)	In the matters of interpretation in respect of any provision contained in the documents referred in para (i) to (ii) the decision of the Engineer-in-Chief, P.W.D. shall be final & binding.	
3)	<u>FOUNDATION</u>	
i)	All works below ground level or low water level, whichever is higher but not above soffit level shall be termed as foundation work.	
ii)	Low water level shall be the average water level met with at the time of doing the foundation work. The maximum and minimum water levels should be recorded by the Assistant Engineer, just before starting the particular foundation and within a reasonable time at the close of that foundation work, the average of these two levels will be the L.W.L. for that foundation work. In case of major bridges such records will be taken by the Executive Engineer.	
4)	<u>SUB-STRUCTURE:</u>	

	The part of the bridge structure below the a) Soffit level of the deck slab/beams and or b) Springing level for arch spans, but above the ground level or L.W.L. whichever is higher, shall be termed as sub structure of the bridge part.
5)	<u>SUPER-STRUCTURE</u>
	The work above (a)Soffit level for deck slabs/beams and (b)Springing level for arch span, including kerbs, railing, expansion joints, beams, slabs etc. shall be termed as super structure of the bridge part.
6)	<u>CONCRETE</u>
a)	The mixing of the concrete, transportation, placing & compaction shall be carried out as per provision made in clause 1708 and 1709 of the specifications of Road and Bridge Works, MORT&H.
b)	For production of concrete-
	i) For overall bridge length of less than 200m. – batch type concrete mixer diesel or electric operated, with a minimum size of 200 liters, automatic water measuring system and integral weigher (hydraulic/pneumatic type). ii) For overall bridge length of 200m. or more - concrete batching and mixing plant fully automatic with minimum capacity of 15 cum. per hour.
c)	Equipment used for production , transportation and compaction of concrete shall be as per provision made in clause 1707 of specifications for Road and Bridge works, MORT&H.
d)	The rates of both ordinary and controlled concrete of any mix is include the cost of preparing and testing concrete cubes as per specifications laid down.
e)	All concrete shall be required compaction to produce dense and homogeneous mass by means of vibrators unless otherwise permitted by the Engineer-in-Charge for exceptional cases, such as concreting under water where use of vibrator is prohibited.
f)	Concrete poured under water shall be required to provide extra cement @10% as per provision made in "Specifications for Roads & Bridges works" Ministry of Road Transport & Highway (5 th Revision).

g)	Finishing of concrete by plastering the surface shall not be done without obtaining written permission from the Executive Engineer. No extra for plastering shall be payable. Light touching up and rubbing the uneven surfaces by carborandum stone/Grinding shall be carried out as part of finishing of concrete surface.
h)	The grading, size, quality of coarse aggregates shall be followed strictly as per the specifications for Road and Bridge works" (Ministry of Road Transport & Highway) 5th revision and respective IRC Codes.
i)	The size and quality of aggregate, mixing etc. for plain concrete or R.C.C. work should be as given in "Specification for Road and Bridge works" of MORT&H (5th Revision).
j)	The rates of concreting items include the cost of form work and centering.
k)	Admixtures may be used for the concrete work to improve the workability with minimum water cement ratio and shall be provided as per provision made in clause 1705 of specifications.
7)	<u>STEEL</u>
i)	HSD (High Strength Deformed Steel bars) conforming to IS 1786-2008 shall be used as reinforcement. Such steel reinforcement bars shall be obtained from the Rolling Mills having integrated steel manufacturing plant and licensed from B.I.S. to manufacture steel for reinforcement. No. re-rolled steel shall be incorporated in the work. The contractor shall have to produce test certificate in the proforma prescribed/approved by B.I.S. from the manufacturer for every batch of steel brought to the site of work. Test Certificate shall be produced prior to it's use and kept at site.
ii)	If the steel is brought by the contractor, the contractor shall be responsible for ensuring the quality of steel and would be bound to conduct any or all tests at his cost for ensuring its quality as per directions of the Engineer-in-Charge. The theoretical consumption of steel shall be worked out at regular interval and shall be verified with actual steel brought to the site.
iii)	Steel used as reinforcement and other structural steel or H.T. steel shall be measured as per the actual quantity of steel placed in the finished structures as per clause 1608 of specification.

iv)	If the steel is issued by the department the contractor shall be paid for labour charges for steel on the quantity measured as per note above (i) Quantity as per theoretical requirement plus 10% (ten) shall be issued to the contractor and deductions will be made for the extra quantity (up to 10%) at rates specified in the N.I.T./Agreement if the steel is supplied by department. If the steel is brought by the contractor, the contractor is held responsible for the quality of the steel. He should use tested steel for which no extra payment is made for tests. If the steel is brought by the contractor measurement shall be recorded as per clause 1608 of specifications for Road and Bridges (MORT&H, 5th Revision).
8)	<u>CEMENT</u>
i)	If the cement is brought by the contractor, the contractor shall be responsible for ensuring the quality of cement and would be bound to conduct all tests at his cost for ensuring its quality as per directions of the Engineer-in-Charge. The theoretical consumption of cement shall be worked out at regular interval and shall be verified with actual cement brought to the site
ii)	The cement, if supplied by department at issue rate to the contractor shall not be more than the theoretical consumption plus 2%. If cement more than this is issued, recovery for the extra quantities shall be made at issue rate plus 10% or prevailing market rate whichever is higher.
iii)	The theoretical consumption of cement should be worked out after including all contingent works i.e., cement godowns, casting plat forms, bed blocks etc. which are necessary for the work in the opinion of Engineer-in-Charge and have actually been constructed, but shall not include items, which are executed for setting right the imperfections in work. This shall be applicable if cement is supplied by the department.
9)	<u>MASONRY WORK</u>
i)	All the stone masonry work shall be strictly as per detailed specifications given in "Specification for Road & Bridge works" of MORT&H (5th Revision).

ii)	In case stone headers are not available, precast headers of M-15 concrete shall be used. Cast-in situ headers are not permitted. Concrete headers may be permitted with the following conditions:
	a) If the cement is supplied departmentally and the cost of cement is recoverable from the contractor due allowance for the actual quantity of cement consumed in the use of cement concrete headers shall be permitted in cement consumption statement but no extra payment for providing cement concrete, headers shall be payable. b) If cement is brought by the contractor no extra payment shall be made for providing concrete headers in place of stone headers.
iii)	Generally for all stone masonry subjected to exposure of water flow (e.g. piers, abutments, returns etc.) C.R. Masonry first sort shall be used unless otherwise provided in the approved drawing.
iv)	In case where width of stone masonry is more than one meter, the central portion of stone masonry (Hearting) shall be done with un-coursed random rubble masonry. Payment for the C.R. Masonry will be limited to 1/2 meter width on either faces and the balance will be paid as un-coursed Random Rubble Masonry.
10)	Cost of Transportation of all materials from the place of delivery up to site of work: i) Is included in the rates of the item of this Schedule of Rates. ii) Materials, as may be required to be issued to the contractor by department shall be specified in the N.I.T. with place of delivery and their issue rates.
11)	<u>LEAD AND LIFTS</u>
	The rates in all items of this S.O.R. are inclusive of all lead, lift and transportation of material. No extra on this account is payable unless otherwise specifically mentioned in any particular item.
12)	<u>ROYALTY AND OTHER TAXES</u>
	Royalty, Octroi duty and all other taxes are included in the rates. No extra on this account shall be payable.

13)	<u>DISMANTLING</u>
	The rates include the complete cost of dismantling and shifting away the dismantled material to place at site of work as directed by Engineer-in-Charge and also the rates include the serviceable dismantled material to be properly stacked at river bank at a location directed by the Engineer-in-Charge.
14)	<u>STORAGE OF MATERIALS:</u> Storage of construction materials at site shall be as per clause 1014 & 1604 of the specifications.
15)	<u>MODE OF MEASUREMENTS:</u> The mode of measurements shall be as per provisions contained in the relevant clauses of the specifications unless specified otherwise.
16)	The rate includes the element of hire & operational charges of all types of plants, machinery and equipment required to complete the work unless specified otherwise.
17)	Rates include provisions of necessary precautionary devices and other arrangements etc. for traffic control, e.g. provision of caution boards, red lights, watchmen flags and flagmen but do not include construction of temporary diversion.
18)	The rates do not include the work of trial pits, which are to be measured and paid separately.
19)	The contractor is bound to install at the site of work a test laboratory capable of conducting all specified field tests as per direction of Engineer-in-Charge and the specified tests of material would be conducted in the presence of department's supervisory staff.
20)	Detailed measurements for steel and concrete for items of R.C.C. approach slab, R.C.C. Railing and R.C.C. wearing coat shall also be recorded in M.B. However the payment shall be regulated as per the item and rates given in the S.O.R.
21)	The measurements of rock excavation are to be done as per clause specified in the Book "Specification of Road and Bridge works" of MORT&H. All serviceable rock excavated shall be issued to the contractor at the rate of Rs. 250/- per cum.
22)	The basic rates for important materials considered in this S.O.R. are as follows :-

	(a) Cement	:-	Rs. 5100.00 per M.T.
	(b) Steel (HSD bar)	:-	Rs. 41500.00 per M.T.
	(c) Structural Steel	:-	Rs. 43000.00 per M.T.
	(d) High Tensile Steel wires/strands	:-	Rs. 70000.00 per M.T

CHAPTER –I			
SITE CLEARANCE AND DISMANTLING			
Item No.	Descriptions	Unit	Rate (Rs)
1.1	Cutting of trees , including cutting of trunks, branches and removal of stumps, roots, stacking of serviceable material with all lifts and up to a lead of 1000 mtrs and earth filling in the depression/pit and as per relevant clauses of section-200 for :-		
i)	Girth from 300 mm to 600 mm	each	197
ii)	Girth beyond 600 mm to 900 mm	each	353
iii)	Girth beyond 900 mm to 1800 mm	each	684
iv)	Girth above 1800 mm	each	1295
1.2	Clearing Grass and Removal of Rubbish (clearing grass and removal of rubbish up to a distance of 50 meters outside the periphery of the area)	hectare	13438
1.3	Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned up to a lead of 1000 meters including removal and disposal of top organic soil not exceeding 150 mm in thickness if required and as per relevant clauses of section-200.		
A	In area of light jungle	hectare	40680
B	In area of thorny jungle	hectare	54484
1.4	Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead upto 1000 meters and as per relevant clauses of section-200 in		
(i)	Lime / Cement Concrete		
A	Lime Concrete, cement concrete grade M-10 and below	cum	294
B	Cement Concrete Grade M-15 & M-20	cum	348
C	Prestressed / Reinforced cement concrete grade M-20 & above	cum	908
(ii)	Brick / Tile work		
A	In lime mortar	cum	187
B	In cement mortar	cum	240
C	In mud mortar	cum	165
D	Dry brick pitching or brick soling	cum	154
(iii)	Stone Masonry		
A	Rubble stone masonry in lime mortar	cum	208
B	Rubble stone masonry in cement mortar.	cum	240
C	Rubble Stone Masonry in mud mortar.	cum	187
D	Dry rubble masonry	cum	176
E	Stone pitching/ dry stone spalls.	cum	165

Item No.	Descriptions	Unit	Rate (Rs)
F	Boulders laid in wire crates including opening of crates and stacking dismantled materials.	cum	187
(v)	Steel work in all types of sections upto a height of 5 m above plinth level excluding cutting of rivet.		
A	Including dismantling	tonne	1143
B	Excluding dismantling.	tonne	851
C	Extra over item No (V) A and (V) B for cutting rivets.	each	8
(vi)	Scraping of bricks dismantled from brick work including stacking.		
A	In lime/Cement mortar	1000 No.	941
B	In mud mortar	1000 No.	336
(vii)	Scraping of Stone from dismantled stone masonry		
A	In cement and lime mortar	cum	378
B	In Mud mortar	cum	80
(viii)	Scraping plaster in lime or cement mortar from brick/ stone masonry	sqm	12
(ix)	Removing all type of hume pipes and stacking within a lead upto 1000 meters including earthwork and dismantling of masonry works around pipes.		
A	Up to 1000 mm dia	meter	400
B	Above 1000 mm dia	meter	531
1.5	Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 meters, stacking serviceable and unserviceable materials separately and as per relevant clauses of section-200.		
A	Bituminous courses	cum	542
B	Granular courses	cum	390
1.6	Dismantling of cement concrete pavement i/c breaking to pieces not exceeding 0.02 cum in volume and stock piling at designated locations and disposal of dismantled materials lead upto 1000 meters, stacking serviceable and unserviceable materials separately and as per relevant clauses of section-200.	cum	1104
1.7	Dismantling guard rails by manual means and disposal of dismantled material with all lifts and lead upto 1000 meters, stacking serviceable materials and unserviceable materials separately and as per relevant clauses of section-200.	meter	59
1.8	Dismantling kerb stone by manual means and disposal of dismantled material with all lifts and lead upto 1000 meter and as per relevant clauses of section-200.	meter	11
1.9	Dismantling kerb stone channel by manual means and disposal of dismantled material with all lifts and lead upto 1000 meter and as per relevant clauses of section-200.	meter	17

Item No.	Descriptions	Unit	Rate (Rs)
1.10	Dismantling of kilometer stone including cutting of earth, foundation and disposal of dismantled material with all lifts and lead upto 1000 m and backfilling of pits.		
A	5th KM stone	each	291
B	Ordinary KM Stone	each	171
C	Hectometer Stone	each	34
1.11	Dismantling of barbed wire fencing/ wire mesh fencing including posts, foundation concrete, back filling of pit by manual means including disposal of dismantled material with all lifts and up to a lead of 1000 meters, stacking serviceable material and unserviceable material separately.	meter	38
1.12	Dismantling of CI water pipe line 600 mm dia including disposal with all lifts and lead upto 1000 meters and stacking of serviceable material and unserviceable material separately under supervision of concerned department.	meter	95

CHAPTER –II FOUNDATION

1. The excavation shall be paid as per the area of foundation concrete block, multiplied by the depth below average ground level at the location of foundation. The rates include the extra quantity of excavation required for providing the excavation in steps or slope as per direction of Engineer-in-Charge.
2. The rates of dewatering in a foundation are inclusive of any coffer damming or diversion of water course required to facilitate the bailing out of water in the particular foundation pit inclusive of all required machinery such as pumps compressors etc. including their hire and running charges, pay staff and P.O.L. etc. complete in all respects.

The volume of dewatering payable shall be measured by multiplying the area of foundation block of the particular foundation with the height of average water level met with during the excavation of the particular foundation. The average water level shall be the average of water level met in excavation pit during excavation or water level in channel whichever is lower and the same observed on completion of excavation. The payment of this item shall be made only after the foundation structure is raised above water level or G.L. whichever is higher. The rate of this item shall not be reduced if coffer-damming or diversion of water course is not done, and dewatering is carried out by employing pumps and/or manually.
3. Excavated hard rock shall be stacked at suitable places at the bank as directed by Engineer-in-Charge. No extra for stacking lead, lift and transportation shall be payable.
4. Back filling up to original bed level shall be done as per clause 304.3.7 of "Specification for Road and Bridges". No extra shall be payable on this account.
5. The concrete mix used in bottom plug of wells shall have a minimum cement content of 330 kg/cum. & a slump of about 150 mm. the concrete shall be placed by tremie under still water condition & cement content of mix be increased by 10%.

6. A levelling coarse of 150mm thickness (Av.) in M-15 shall be provided before laying open foundations.
7. The rates of well sinking include the charges of labour, plant, cost of P.O.L. and other materials and accessories. The rates also include the cost of diversion of channel, making of island, if required to be done for laying the cutting edge, kerb and steining. the permissible tilt and shift in well in its final position shall be as per IRC-78-2014. The rates include the cost of rectification of tilt and shift in excess of permissible limit. No extra over these rates are payable for sinking of well.
8. For the purpose of the computation of the volume in well sinking, the cubic content of well shall be measured by the portion contained in outer diameter of well steining. Projection of R.C.C. kerb, if any shall not be measured.
9. The rates of concreting in all types of foundation include also the cost of formwork, staging etc. complete.

CHAPTER- II			
FOUNDATIONS			
Item No.	Descriptions	Unit	Rate (Rs)
2.1	Excavation for Structures Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material including dewatering etc. complete.		
I	Ordinary soil		
(i)	Upto 3 m depth	cum	146
(ii)	3 m to 6 m depth	cum	167
(iii)	Above 6 m depth	cum	205
	Add extra 20% in the rates of above items for dewatering (Assessment of dewatering shall be made as per site condition)		
	The cost of shoring and shuttering, where needed, be added @ 1 percent on cost of excavation for open foundation.		
II	Ordinary rock (not requiring blasting)	cum	246
	Add extra 20% in the rates of above items for dewatering (Assessment of dewatering shall be made as per site condition)		
III	Hard rock (requiring blasting)	cum	678
	Add extra 20% in the rates of above items for dewatering (Assessment of dewatering shall be made as per site condition)		
IV	Hard rock (blasting prohibited)	cum	802
	Add extra 20% in the rates of above items for dewatering (Assessment of dewatering shall be made as per site condition)		
V	Marshy soil		
	upto 3 m depth	cum	490
	Add extra 30% in the rates of above items for dewatering (Assessment of dewatering shall be made as per site condition)		
	Add extra for shoring and shuttering where needed.		
VI	Back Filling in Marshy Foundation Pits as per specifications	cum	299
2.2	Filling Annular Space Around Footing in Rock (Lean cement concrete M15 nominal mix.	cum	4613
2.3	Sand Filling in Foundation Trenches as per Drawing & Technical Specifications.	cum	1234
2.4	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications.	cum	5101
2.5	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specifications and as per clauses of section 1500,1700 and 2100.		
(i)	Square Rubble Coursed rubble masonry (first sort)	cum	3857
(ii)	Random Rubble Masonry Coursed / uncoursed	cum	3960
2.6	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications.		
A	Using concrete mixer		

Item No.	Descriptions	Unit	Rate (Rs)
(i)	PCC Grade M15	cum	4613
(ii)	PCC Grade M20	cum	5247
(iii)	PCC Grade M25	cum	5921
(iv)	PCC Grade M30	cum	5957
(v)	RCC Grade M20	cum	5297
(vi)	RCC Grade M25	cum	5979
(vii)	RCC Grade M30	cum	5992
(viii)	RCC Grade M35	cum	6090
B	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	PCC Grade M20	cum	5319
(ii)	PCC Grade M25	cum	5989
(iii)	PCC Grade M30	cum	6019
(iv)	RCC Grade M20	cum	5362
(v)	RCC Grade M25	cum	6043
(vi)	RCC Grade M30	cum	6058
(vii)	RCC Grade M35	cum	6155
2.7	Well Foundation (Providing and constructing temporary island for construction of foundation for Well.)		
(i)	Depth of water 1.0 m and height of island to be 1.25m.	each	38345
(ii)	Depth of water 5.0 m and height of island 5.5 m.	each	262931
(iii)	Providing and constructing one span service road to reach island location from one pier location to another pier location	meter	1729
2.8	Providing and laying cutting edge of mild steel weighing 40 kg per meter for well foundation complete as per drawing and technical specifications per relevant clause of section 1200 and 1900.	MT	80637
2.9	Plain/Reinforced cement concrete, in well foundation complete as per drawing and technical specification as per clauses of section 1200,1500 and 1700.		
A	Well curb		
(a)	Using concrete mixer		
(i)	RCC Grade M25	cum	6916
(ii)	RCC Grade M35	cum	7096
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	RCC Grade M25	cum	6990
(ii)	RCC Grade M35	cum	7172
B	Well steining		
(a)	Using concrete mixer		
(i)	PCC Grade M15	cum	4880
(ii)	PCC Grade M20	cum	5551
(iii)	PCC Grade M25	cum	6278
(iv)	PCC Grade M30	cum	6363
(v)	RCC Grade M20	cum	5603
(vi)	RCC Grade M25	cum	6339
(vii)	RCC Grade M30	cum	6370

Item No.	Descriptions	Unit	Rate (Rs)
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	PCC Grade M25	cum	6351
(ii)	PCC Grade M30	cum	6429
(iii)	RCC Grade M20	cum	5672
(iv)	RCC Grade M25	cum	6408
(v)	RCC Grade M30	cum	6440
C	Bottom Plug		
(a)	Using concrete mixer		
(i)	PCC Grade M20	cum	5717
(ii)	PCC Grade M25	cum	6210
(iii)	PCC Grade M30	cum	6260
(b)	Using Batching Plant, Transit Mixer and Crane/concrete pump		
(i)	PCC Grade M20	cum	5811
(ii)	PCC Grade M25	cum	6301
(iii)	PCC Grade M30	cum	6355
D	Intermediate plug		
(a)	Using concrete mixer		
(i)	PCC Grade M20	cum	5709
(ii)	PCC Grade M25	cum	5944
(b)	Using Batching Plant, Transit Mixer and Crane/concrete pump		
(i)	PCC Grade M20	cum	5809
(ii)	PCC Grade M25	cum	6042
E	Top plug		
(a)	Using Concrete Mixer		
(i)	PCC Grade M15	cum	4437
(ii)	PCC Grade M20	cum	5046
(iii)	PCC Grade M25	cum	5708
(b)	Using Batching Plant, Transit Mixer and Crane/concrete pump		
(i)	PCC Grade M25	cum	5774
F	Well cap		
(a)	Using concrete Mixer		
(i)	RCC Grade M25	cum	5979
(ii)	RCC Grade M30	cum	5992
(iii)	RCC Grade M35	cum	6090
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	RCC Grade M25	cum	6045
(ii)	RCC Grade M30	cum	6057
(iii)	RCC Grade M35	cum	6155
(iv)	RCC Grade M40	cum	6263
2.10	Sinking of 6 m external diameter well (other than pneumatic method of sinking) through all types of soil and rock complete as per drawing and technical specifications as per section 1200 in (the rate include removal of all type of obstructions).		

Item No.	Descriptions	Unit	Rate (Rs)
A	Sandy / Clayey Soil		
(i)	Depth below bed level upto 3.0 M	cum	458
(ii)	Beyond 3m upto 10m depth	cum	898
(iii)	Beyond 10 m upto 20 m		
	Notes		
a)	Add 5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
(iv)	Beyond 20m upto 30 m		
a)	Add 7.5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Soft rock (6m dia well)	Cum	1038
C	Hard rock (6m dia well)	Cum	1103
2.11	Sinking of 7 m external diameter well (other than pneumatic method of sinking) through all types of soil and rock complete as per drawing and technical specifications as per section 1200 in (the rate include removal of all type of obstructions).		
A	Sandy / Clayey Soil		
(i)	Depth below bed level upto 3.0 M	Cum	493
(ii)	Beyond 3m upto 10m depth	Cum	667
(iii)	Beyond 10 m upto 20 m		
	Notes		
a)	Add 5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
(iv)	Beyond 20m upto 30 m		
a)	Add 7.5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Soft rock (7m dia well)	Cum	727
C	Hard rock (7m dia well)	Cum	918
2.12	Sinking of 8 m external diameter well (other than pneumatic method of sinking) through all types of soil and rock complete as per drawing and technical specifications as per section 1200 in (the rate include removal of all type of obstructions).		
A	Sandy / Clayey Soil		
(i)	Depth upto 3.0 M	Cum	461
(ii)	Beyond 3m upto 10m depth	Cum	522
(iii)	Beyond 10 m upto 20 m		
	Notes		
a)	Add 5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
(iv)	Beyond 20m upto 30 m		
a)	Add 7.5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Soft rock (8m dia well)	Cum	620
C	Hard rock (8m dia well)	Cum	704
2.13	Sinking of 9 m external diameter well (other than pneumatic method of sinking) through all types of soil and rock complete as per drawing and technical specifications as per section 1200 in (the rate include removal of all type of obstructions).		
A	Sandy / Clayey Soil		
(i)	Depth below bed level upto 3.0 M	Cum	382
(ii)	Beyond 3m upto 10m depth	Cum	446

Item No.	Descriptions	Unit	Rate (Rs)
(iii)	Beyond 10 m upto 20 m		
	Notes		
a)	Add 5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
(iv)	Beyond 20m upto 30 m		
a)	Add 7.5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Soft rock (9m dia well)	Cum	605
C	Hard rock (9m dia well)	Cum	662
2.14	Sinking of 10 m external diameter well (other than pneumatic method of sinking) through all types of soil and rock complete as per drawing and technical specifications as per section 1200 in (the rate include removal of all type of obstructions).		
A	Clayey soil (10m dia. Well)		
(i)	Depth below bed level upto 3.0 M	Cum	332
(ii)	Beyond 3m upto 10m depth	Cum	347
(iii)	Beyond 10 m upto 20 m		
	Notes		
A	Add 5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Add for dewatering @ 5% of cost, if required.		
(iv)	Beyond 20m upto 30 m		
A	Add 7.5% for every additional meter depth of sinking over the rate of sinking for the previous meter		
B	Soft rock (10m dia well)	Cum	532
C	Hard rock (10m dia well)	Cum	600
2.15	Sand filling in wells complete as per drawing and technical specifications as per section 1210.	cum	1234
2.16	Providing steel liner 10 mm thick for curbs and 6mm thick for steining of wells including fabricating and setting out as per detailed drawing and specifications as per section 1200 and 1900.	MT	72540
2.17	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m as per section 1100 and 1700.		
(i)	Pile diameter-750 mm	meter	7830
(ii)	Pile diameter-1000 mm	meter	12595
(iii)	Pile diameter-1200 mm	meter	15693
2.18	Driven cast-in-place vertical M35 grade R.C.C. pile excluding reinforcement complete as per drawing & Technical Specification as per section 1100 and 1700.		
(i)	Pile diameter-750 mm	meter	5673
(ii)	Pile diameter-1000 mm	meter	8829
(iii)	Pile diameter-1200 mm	meter	12938
2.19	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing & Technical Specification as per section 1100 and 1700.		
(i)	Pile diameter-500 mm	meter	2860
(ii)	Pile diameter-750 mm	meter	4438

Item No.	Descriptions	Unit	Rate (Rs)
(iii)	Pile diameter-1000 mm	meter	7085
2.20	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing & Technical Specification as per section 1100 and 1700.		
(i)	Size of pile - 300 mm x 300 mm	meter	2174
(ii)	Size of pile - 500 mm x 500 mm	meter	3148
(iii)	Size of pile - 750 mm x 750 mm	meter	5498
2.21	Pile Load Test on single Vertical Pile in accordance with IS:2911(Part-IV) in static load method only		
(i)	Initial and routine load test	Tonne	1500
(ii)	Lateral load test	Each Test	75000
2.22	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specifications per clause 1100,1500 and 1700.		
A	Using concrete mixer		
(i)	RCC Grade M25	cum	5712
(ii)	RCC Grade M30	cum	5768
(iii)	RCC Grade M35	cum	5886
B	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	RCC Grade M25	cum	5786
(ii)	RCC Grade M30	cum	5856
(iii)	RCC Grade M35	cum	5960
2.23	Levelling course for Pile cap (Providing and laying of P.C.C.M-15 levelling course 100mm thick below the pile cap.)	cum	4519
2.24	Supplying, fitting and placing HSD (High Strength Deformed Steel) bar reinforcement in foundation complete as per drawing and technical specifications as per section 1600.	MT	68693
2.25	Taking exploratory boring 100 mm dia. at the location of piers and abutments or for high embankments in approaches in all types of strata as per I.R.C. 78-2014 and section 2400 of specifications for collection of samples at different depth (rock sample and undisturbed soil sample) and test including preserving core samples as per specifications.		
(i)	Upto 1.0 m below bed level	each	5951
(ii)	Beyond 1.0 m upto 5.0 m depth	meter	1300
(iii)	Beyond 5.0 m depth	meter	1475
2.26	Providing and laying 1.5 m deep in rock and 1.5 m above rock 25 mm dia Tor Steel dowel bars in foundation including drilling 65mm dia bore hole in rock necessary bending, hooking, tying, reinforcement in position and grouting etc. complete as per drawings and specifications.	each	1015

CHAPTER –III

SUB-STRUCTURE

1. The rates of bearing are inclusive of the charges required for testing of bearing, procurement, transport, if required greasing while storing and at the time of fixing etc. all complete.
2. The use of A.C. Pipes for weep holes is permitted only in PCC/RCC/Brick masonry sub-structure. In stone masonry inbuilt weep holes of size 80mm x 150mm shall be constructed and no extra for this work is payable. No deduction for the recess or for pipes due to weep holes shall be made in the measurement of stone/brick masonry, PCC and RCC.
3. The rates of concreting in all items include the cost of form work and staging.
4. For elastomeric bearing pads the concrete surface shall be leveled such that the variation is not more than 1.5mm from the straight edge placed in any direction across the area.
5. The bearings should be procured only from those manufactures who have not been disqualified by MORT&H. Only finished weight of bearings as brought to the site and fixed in position shall be taken into account for measurement.
6. Use of plate compactor is mandatory for compaction of back fill behind the abutment and returns and filter media shall be provided as per provision MORT & H clause 2504 and table No. 300-3.

CHAPTER – III			
SUB-STRUCTURE			
Item No.	Descriptions	Unit	Rate (Rs)
3.1	Brick masonry work in 1:3 in sub-structure complete excluding pointing and plastering, as per drawing and technical specifications as per section 1300 and 2200.	cum	5355
3.2	Add extra to item above if fly ash brick work are used.	cum	536
3.3	Pointing with cement mortar (1:3) on brick work in substructure as per Technical specifications section 1300 and 2200.	sqm	52
3.4	Plastering with cement mortar (1:3) on brick work in sub-structure as per Technical specifications section 1300 and 2200.	sqm	110
3.5	Stone masonry work in cement mortar 1:3 for substructure complete as per drawing and Technical Specifications section 1400 and 2200.		
(i)	Random Rubble Masonry	cum	3968
(ii)	Coursed rubble masonry (first sort)	cum	4134
(iii)	Ashlar masonry (first sort)	cum	4881
3.6	Providing and laying Plain/Reinforced cement concrete in sub-structure complete as per drawing and technical specifications section 1500, 1700 and 2200 (Newly laid concrete shall be covered by gunny bags).		
A	Height upto 5m		
(a)	Using concrete Mixer		
(i)	P.C.C. Grade M-15	cum	4880
(ii)	P.C.C. Grade M-20	cum	5551
(iii)	P.C.C. Grade M-25	cum	6278
(iv)	P.C.C. Grade M-30	cum	6363
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	P.C.C. Grade M-25	cum	6351
(ii)	P.C.C. Grade M-30	cum	6429
B	Height 5m to 10m		
(a)	Using concrete Mixer		
(i)	P.C.C. Grade M-25	cum	6507
(ii)	P.C.C. Grade M-30	cum	6594
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	P.C.C. Grade M-25	cum	6582
(ii)	P.C.C. Grade M-30	cum	6663
C	Height above 10m		
(a)	Using concrete Mixer		
(i)	P.C.C. Grade M-25	cum	6792
(ii)	P.C.C. Grade M-30	cum	6883
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	P.C.C. Grade M-25	cum	6871

Item No.	Descriptions	Unit	Rate (Rs)
(ii)	P.C.C. Grade M-30	cum	6956
D	Height upto 5m		
(a)	Using concrete Mixer		
(i)	R.C.C. Grade M-20	cum	5603
(ii)	R.C.C. Grade M-25	cum	6339
(iii)	R.C.C. Grade M-30	cum	6370
(iv)	R.C.C. Grade M-35	cum	6505
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	R.C.C. Grade M-20	cum	5672
(ii)	R.C.C. Grade M-25	cum	6408
(iii)	R.C.C. Grade M-30	cum	6440
(iv)	R.C.C. Grade M-35	cum	6575
E	Height 5m to 10m		
(a)	Using concrete Mixer		
(i)	R.C.C. Grade M-20	cum	5807
(ii)	R.C.C. Grade M-25	cum	6547
(iii)	R.C.C. Grade M-30	cum	6549
(iv)	R.C.C. Grade M-35	cum	6647
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	R.C.C. Grade M-20	cum	5878
(ii)	R.C.C. Grade M-25	cum	6617
(iii)	R.C.C. Grade M-30	cum	6621
(iv)	R.C.C. Grade M-35	cum	6718
F	Height above 10m		
(a)	Using concrete Mixer		
(i)	R.C.C. Grade M-20	cum	6062
(ii)	R.C.C. Grade M-25	cum	6858
(iii)	R.C.C. Grade M-30	cum	6862
(iv)	R.C.C. Grade M-35	cum	6860
(b)	With Batching Plant, Transit Mixer and Concrete Pump		
(i)	R.C.C. Grade M-20	cum	6136
(ii)	R.C.C. Grade M-25	cum	6932
(iii)	R.C.C. Grade M-30	cum	6966
(iv)	R.C.C. Grade M-35	cum	7140
3.7	Supplying, fitting and placing HSD (High Strength Deformed Steel) bars reinforcement in sub-structure complete as per drawing and technical specifications section 1600 and 2200.	MT	69002
3.8	Providing weep holes in Brick masonry/ Plain/ Reinforced concrete abutment, wing wall/return wall with 100 mm dia. AC pipe, extending through the full width of the structure with slope of 1 V: 20 H towards drawing face. Complete as per drawing and Technical specifications section 2706 and 2200.	meter	321

Item No.	Descriptions	Unit	Rate (Rs)
3.9	Back filling behind abutment , wing wall and return wall complete as per drawing and Technical specification 710.1.4 of I.R.C. 78 and 2200. (i) Granular material	cum	905
3.10	Providing and laying of Filter media with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MORT&H specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment, wing wall and return wall to the full height compacted to a firm condition complete as per drawing and technical specifications 710.1.4 of I.R.C. 78 and 2200.	cum	1926
3.11	Supplying, fitting and fixing in position true to line and level cast steel rocker bearing conforming to IRC: 83(Pt.-1) section IX and clause 2003 of MORT&H specifications complete including all accessories as per drawing and Technical Specifications section 2000, 1000 and 2200.	Per tonne capacity	450
3.12	Supplying, fitting and fixing in position true to line and level forged steel roller bearing conforming to IRC: 83(Pt.-1) section IX and clause 2003 of MORT&H specifications complete including all accessories as per drawing and Technical Specifications section 2000, 1000 and 2200.	Per tonne capacity	530
3.13	Supplying, fitting and fixing in position true to line and level sliding plate bearing with PTFE surface sliding on stainless steel complete including all accessories as per drawing and Technical Specifications and BS: 5400, section 9.1 & 9.2 (for PTFE) and clause 2004 of MORT&H Specifications section 2000 and 2200.	Per tonne capacity	473
3.14	Supplying, fitting and fixing in position true to line and level elastomeric bearing conforming to IRC: 83 (Part-II) section IX and clause 2005 of MORT&H specifications complete including all accessories as per drawing and Technical Specifications section 2000 and 2200.	Per cubic centimeter	1
3.15	Supplying, fitting and fixing in position true to line and level sliding plate bearing with stainless steel plate sliding on stainless steel plate with mild steel matrix complete including all accessories as per drawing and Technical Specifications section 2000 and 2200.	Per tonne capacity	426
3.16	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by a disc or unreinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel/fabricated structural steel, metal and elastomer elements to be as per IRC: 83 part-I & II respectively and other parts conforming to BS: 5400, section 9.1 & 9.2 and clause 2006 of MORT&H Specifications complete as per drawing and approved technical specifications.	Per tonne capacity	312
3.17	Providing and fixing in position tar paper bearing for slab as per approved drawings and specification.	sqm	66

CHAPTER –IV
SUPER-STRUCTURE

1. The rates of concreting include the cost of form work, centering staging etc. complete.
2. For super structure only steel form work will be accepted. The thickness of steel plate shall not be less than 3 mm. The form work shall be adequately stiffened by brackets and angles not more than 15 cm. apart in such a manner that it is free from distortion during handling and vibration of concrete. No extra for form work shall be payable.
3. Centering made up of steel trusses below soffit shall not be supported in recess made in sub-structure. The contractor may provide steel trusses supported on suitably designed bracket, anchored to the pier/pier-cap. Providing safe centering shall be solely contractor's responsibility. The contractor shall remove all bolts, anchors protruding beyond the pier/pier-cap after removal of centering. No extra for centering shall be payable.
4. Contractor shall have the option to adopt launching of super-structure but in such cases prior permission of the department be obtained by getting launching arrangement initially approved. No deduction in the rate of concrete would be done nor any extra would be paid in case the launching is resorted to.
5. The rate of prestressing of H.T. steel is complete rate including hire and running expenses of plant and machineries, labour involved in stressing operations, anchorages and ducts or sheathing etc., complete including grouting.
6. The rates of wearing coat are inclusive of reinforcement provided, construction joints between panels and the form work at the panels. Construction joints in panel shall be 10 mm. wide and shall be filled with premoulded joint filler. Filling of expansion joints between span over piers/abutment or at articulation is not included in the rate.
7. The payment of railing includes the construction of required intermediate posts and end posts. The length of railing for payment purposes on each side separately, be measured from the outer edges of end posts.
8. New type expansion joints may be obtained from prequalified suppliers by MORT&H and the firm will have to give warranty of 10 years of trouble free performance.

CHAPTER- IV			
SUPER-STRUCTURE			
Item No.	Descriptions	Unit	Rate (Rs)
4.1	Furnishing and Placing Reinforced/Prestressed cement concrete in super-structure as per drawing and Technical Specification sections 1500, 1600 and 1700 (Newly laid concrete shall be covered by gunny bags).		
A	RCC Grade M25		
I	For Solid Slab Super Structure		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	6877
(ii)	Height 5m to 10m	cum	7164
(iii)	Height above 10m	cum	7450
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	6957
(ii)	Height 5m to 10m	cum	7247
(iii)	Height above 10m	cum	7537
II	For T-beam & slab		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7164
(ii)	Height 5m to 10m	cum	7450
(iii)	Height above 10m	cum	7737
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7247
(ii)	Height 5m to 10m	cum	7537
(iii)	Height above 10m	cum	7827
B	RCC Grade M 30		
I	For Solid Slab Super Structure		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	6973
(ii)	Height 5m to 10m	cum	7263
(iii)	Height above 10m	cum	7554
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7032
(ii)	Height 5m to 10m	cum	7325
(iii)	Height above 10m	cum	7618
II	For T-beam & slab		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7263
(ii)	Height 5m to 10m	cum	7554

Item No.	Descriptions	Unit	Rate (Rs)
(iii)	Height above 10m	cum	7844
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7325
(ii)	Height 5m to 10m	cum	7618
(iii)	Height above 10m	cum	7911
C	RCC/PSC Grade M35		
I	For Solid Slab Super Structure		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7002
(ii)	Height 5m to 10m	cum	7299
(iii)	Height above 10m	cum	7595
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7055
(ii)	Height 5m to 10m	cum	7354
(iii)	Height above 10m	cum	7653
II	For T-beam & slab		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7299
(ii)	Height 5m to 10m	cum	7595
(iii)	Height above 10m	cum	7892
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7354
(ii)	Height 5m to 10m	cum	7653
(iii)	Height above 10m	cum	7952
III	For Box Girder and Balanced Cantilever		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	8189
(ii)	Height 5m to 10m	cum	8782
(iii)	Height above 10m	cum	9375
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	8251
(ii)	Height 5m to 10m	cum	8849
(iii)	Height above 10m	cum	9446
D	PSC Grade M-40		
I	For Solid Slab Super Structure		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7239
(ii)	Height 5m to 10m	cum	7541
(iii)	Height above 10m	cum	7842
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7136

Item No.	Descriptions	Unit	Rate (Rs)
(ii)	Height 5m to 10m	cum	7438
(iii)	Height above 10m	cum	7740
II	For T-beam & slab		
(a)	Using Concrete Mixer		
(i)	Height upto 5m	cum	7541
(ii)	Height 5m to 10m	cum	7842
(iii)	Height above 10m	cum	8144
(b)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7438
(ii)	Height 5m to 10m	cum	7740
(iii)	Height above 10m	cum	8043
III	For cast in situ Box Girder, Segment Construction and Balanced Cantilever		
	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	8345
(ii)	Height 5m to 10m	cum	8950
(iii)	Height above 10m	cum	9555
E	PSC Grade M-45		
I	For solid slab/voided slab super-structure		
(a)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7341
(ii)	Height 5m to 10m	cum	7657
(iii)	Height above 10m	cum	7973
II	For T-beam & slab including launching of precast girders by launching truss upto 40 m span		
(a)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	7657
(ii)	Height 5m to 10m	cum	7973
(iii)	Height above 10m	cum	8290
III	For cast-in-situ box girder, segmental construction and balanced cantilever		
(a)	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	8606
(ii)	Height 5m to 10m	cum	9239
(iii)	Height above 10m	cum	9872
F	PSC Grade M-50		
	For cast-in-situ box girder, segmental construction and balanced cantilever Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	8814
(ii)	Height 5m to 10m	cum	9467
(iii)	Height above 10m	cum	10120

Item No.	Descriptions	Unit	Rate (Rs)
G	PSC Grade M-55		
	For cast-in-situ box girder, segmental construction and balanced cantilever		
	Using Batching Plant, Transit Mixer and Concrete Pump		
(i)	Height upto 5m	cum	9238
(ii)	Height 5m to 10m	cum	9923
(iii)	Height above 10m	cum	10607
4.2	Supplying, fitting and placing HSD (High Strength Deformed Steel) bar reinforcement in super-structure complete as per drawing and technical specifications	MT	70101
4.3	High tensile steel wires/strands including all accessories for stressing, stressing operations and grouting complete as per drawing and Technical Specifications	MT	160407
4.4	Providing and laying Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications as per relevant clause of section 2700.	cum	11847
4.5	Construction of precast RCC railing of M30 Grade, aggregate size not exceeding 12 mm, true to line and grade, tolerance of vertical RCC post not to exceed 1 in 500, centre to centre spacing between vertical post not to exceed 2000 mm, leaving adequate space between vertical post for expansion, complete as per approved drawings and technical specifications as per relevant clauses of section 1500, 1600, 1700 and 2703 (vide drawing No. SD/202, SD/304)	meter	1874
4.6	Construction of RCC railing of M30 Grade in-situ with 20 mm nominal size aggregate, true to line and grade, tolerance of vertical RCC post not to exceed 1 in 500, centre to centre spacing between vertical post not to exceed 2000 mm, leaving adequate space between vertical post for expansion, complete as per approved drawings and technical specifications. (vide drawing No. SD/201, SD/304)	meter	1819
4.7	Providing, fitting and fixing mild steel railing complete as per drawing and Technical Specification and as per relevant clauses of section 1900 and 2703.2	meter	2963
4.8	Providing and Fixing in position collapsible pipe railing of approved design including 2 coats painting etc. complete with channel post ISMC 100x50mm (0.95m high) and 48.4mm outer dia lighter type class "A" G.I. pipe excluding cost of end concrete post.	meter	1531
4.9	Drainage Spouts complete as per drawing and Technical specifications of section 2705	Each	2007
4.10	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification and as per relevant section 2700	Cum	4437

Item No.	Descriptions	Unit	Rate (Rs)
4.11	Providing and laying M-30 grade Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification and as per relevant sections 1500, 1600, 1700 and 2704	Cum	9467
4.12	Providing anti-corrosive treatment to HSD (High Strength Deformed Steel) reinforcement with Fusion Bonded Epoxy Coating (FBEC) (To be taken as per the prevailing market rates.)	tonne	24420
4.13	Providing and fixing Helical pipes of 600mm dia in voided concrete slabs including 20mm dia tie rod and sealing joints etc. as per section 1700 and 1800.	M	671
4.14	Filler joint		
A	Providing & fixing 2 mm thick corrugated copper plate (12 m long x 25 cm wide) in expansion joint complete as per drawing & Technical Specification.	sqm	21860
B	Providing & fixing 20 mm thick compressible fiber board (12 m long x 25 cm deep) in expansion joint complete as per drawing & Technical Specification.	sqm	1204
C	Providing and fixing in position 20 mm thick premoulded joint filler (12 m long x 30 cm deep) in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications.	Sqm	683
D	Providing and filling joint sealing compound (12 m long x 100 mm wide x 10 mm deep recess) as per drawings and technical specifications with coarse sand and 6% bitumen by weight	Sqm	220
4.15	Asphaltic Plug joint (Providing and laying of asphaltic plug joint to provide for horizontal movement of 25 mm and vertical movement of 2 mm, depth of joint varying from 75 mm to 100 mm, width varying from 500 mm to 750 mm (in traffic direction), covered with a closure plate of 200mm x 6mm of weldable structural steel conforming to IS: 2062, asphaltic plug to consist of polymer modified bitumen binder, carefully selected single size aggregate of 12.5 mm nominal size and a heat resistant foam caulking/backer rod, all as per approved drawings and specifications section 2600)	meter	1964
4.16	Elastomeric Slab Steel Expansion Joint Providing and laying of an elastomeric slab steel expansion joint, catering to right or skew (less than 20 deg., moderately curved with maximum horizontal movement upto 50 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorized representative ensuring compliance to the manufacturer's instructions for installation and clause 2606 of MORT&H specifications for road & bridge works.	meter	20140

Item No.	Descriptions	Unit	Rate (Rs)
4.17	Compression Seal Joint	meter	11693
	Providing and laying of compression seal joint consisting of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a preformed chloroprene elastomer or closed cell foam joint sealer compressed and fixed into the joint gap with special adhesive binder to cater for a horizontal movement upto 40 mm and vertical movement of 3 mm.		
4.18	Strip Seal Expansion Joint (Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorized representative ensuring compliance to the manufacturer's instructions for installation.)	meter	11124
4.19	Modular Strip / Box Seal Joint		
A	(Providing and laying of a modular strip Box steel expansion joint including anchorage catering to a horizontal movement beyond 70 mm and upto 140mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	meter	17464
B	Providing and laying of a modular strip box seal expansion joint catering to a horizontal movement beyond 140mm and upto 210mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	meter	18926
4.20	Painting on kerbs in black and yellow alternate bands including cost of material and labour complete as per drawings and specifications as per clause 803.		
	With Road Marking Paint	RM	56
4.21	Painting on concrete surface of R.C.C. Railing (Providing and applying 2 coats of water based cement paint to unplastered concrete surface after cleaning the surface of dirt, dust, oil, grease, efflorescence and applying paint @ of 1 litre for 2 Sq.m.)	Sqm	151
4.22	Providing and Fixing of Av. 20mm thick marble plate i/c cutting and polishing and inscribed details as per approved drawing i/c engraving the matter as desired.	each	5000
4.23	Providing and Fixing of Av. 20mm thick Granite plate including cutting and polishing and inscribed details as per approved drawing i/c engraving the matter as desired.	each	6600

Item No.	Descriptions	Unit	Rate (Rs)
4.24	Testing of span of bridge for deflection due to live load with platform for loading arrangements, apparatus for measurement etc. complete as per drawing and specifications (As per IRC : SP-51)	tonne	850
4.25	Performing detailed survey and investigation and collection of hydraulic datas (essential design data as per IRC special publication No. 13) consisting of catchment area, L-section of road and stream, cross section of stream at the point of crossing, at up-stream and down stream site, as well as trial pit section result ascertaining and marking of H.F.L., O.F.L., transferring and fixing of pucca bench marks at site etc. complete i/c cost of necessary materials and labour required for survey work.(Sub-Engineer to be engaged from regular establishment) .		
(i)	For catchment areas less than 1.25 sq Km.	each	3124
(ii)	For catchment areas 1.25 to 2.5 sq.Km.	each	3806
(iii)	For catchment areas 2.5 to 10 sq.Km.	each	4598
4.26	Providing & fixing in position structural steel expansion joint i/c. cutting riveting bolting welding as per MORT&H Std. drawing No. BD/1-69 'B' and specification as per section 1000, 1900 and 2600.	metre	2500
4.27	Providing and fixing for hand railing top of crash barrier including cost of material complete as per approved drawing.	metre	600
4.28	Providing & filling 37/40 mm. wide expansion joint between spans in wearing coat with premoulded joint filler, primer coat and joint sealing compound as per MORT&H standard drawing No. BD/1-69 'B' and specifications as per section 2600 in:-		
(i)	R.C.C. 75 mm deep wearing coat	metre	150
(ii)	Asphaltic concrete 56 mm. deep wearing coat.	metre	120

CHAPTER- V			
RIVER TRAINING AND PROTECTION WORKS			
Item No.	Description	Unit	Rate (Rs)
5.1	Providing and laying boulders apron on river bed for protection against scour with stone boulders weighing not less than 40 kg each complete as per drawing and Technical specification as per relevant clauses of section 2503	cum	2413
5.2	Providing and laying of boulder apron laid in wire crates made with 4mm dia GI wire conforming to IS: 280 & IS:4826 in 100mm x 100mm mesh (weaved diagonally) including 10% extra for laps and joints laid with stone boulders weighing not less than 40 kg each.	cum	3731
5.3	Providing and laying of apron with cement concrete blocks of size 0.5x0.5x0.5 m cast in-situ and made with nominal mix of M-15 grade cement concrete with a minimum cement content of 250 kg/cum as per specification.	cum	4705
5.4	Providing and laying Pitching on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and Technical specifications as per section 2504.		
A	Stone/Boulder	cum	2413
B	Cement Concrete blocks of size 0.3x0.3 x0.3 m cast in cement concrete of Grade M15	cum	4705
5.5	Providing and laying Filter material underneath pitching in slopes complete as per drawing and Technical specification including trimming of slopes to proper profile and preparation of bed as per section 2504.	cum	2079
5.6	Laying of a geotextile filter between pitching and embankment slopes on which pitching is laid to prevent escape of the embankment material through the voids of the stone pitching/cement concrete blocks as well as to allow free movement of water without creating any uplift head on the pitching as per any relevant section 700 and 2504 of specifications.	sqm	398
5.7	Providing and laying Flooring complete as per drawing and Technical specifications laid over cement concrete bedding as per section 2505		
A	Rubble stone laid in cement mortar 1:3	cum	5524
B	Cement Concrete blocks Grade M15	cum	6197
5.8	Construction of Dry rubble Flooring at cross drainage works for relatively less important works as per section 2506 of specifications.	cum	2725
5.9	Curtain wall complete as per drawing and Technical specification as per section 2507.2		
A	Coursed Rubble masonry (1 st sort)	cum	3857
B	Cement concrete Grade M15	cum	4613

Item No.	Descriptions	Unit	Rate (Rs)
5.10	Construction of flexible apron 1 m thick comprising of loose stone boulders weighing not less than 40 kg beyond curtain wall.	cum	2476
5.11	Providing and construction of a gabain structure for retaining earth with segments of wire crates of size 7 m x 3 m x 0.6 m each divided into 1.5 m compartments by cross netting, made from 4 mm galvanized steel wire @ 32 kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be tied with 4 mm galvanised steel wire	cum	3982
5.12	Providing and constructing gabain structures for erosion control, river training works and protection works with wire crates of size 2 m x 1 m x 0.3 m each divided into 1m compartments by cross netting, made from 4 mm galvanized steel wire @ 32 kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 mm x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be securely tied with 4 mm galvanized steel wire.	cum	6167
5.13	Providing and laying brick on edge flooring with 1st class bricks including cement slurry in cement sand mortar 1:4 complete as per drawing and specifications as per section 1000 & 1300.	sqm	285
5.14	Providing cement pointing 1:2 flush on brick on edge floor complete as per drawing and specifications as per section 1000 & 1300.	sqm	62
5.15	Providing cement plaster 12 mm thick in cement mortar 1:3 complete as per drawing and specifications as per section 1000 & 1300.	sqm	100
5.16	Providing "Antirust Chemical coating" on the work of reinforcement (Providing antirust corrosive treatment to HSD (High Strength Deformed Steel) reinforcement with antirust chemical -Zinc rich epoxy resin coating as per section 1600).	MT	975
5.17	Grouting with C.M. 1:4 in Pitching as per drawing and technical specification.	cum	1000

CHAPTER- VI
REPAIR AND REHABILITATION

Item No.	Description	Unit	Rate (Rs)
6.1	Removal of existing cement concrete wearing coat including its disposal complete as per Technical specification without causing any detrimental effect to any part of the bridge structure and removal of dismantled material with all lifts and lead upto 1000m as per section 2811.	sqm	99
6.2	Removal of existing asphaltic wearing coat comprising of 50 mm thick asphaltic concrete laid over 12 mm thick mastic asphalt including disposal with all lift and lead upto 1000m as per specifications.	sqm	74
6.3	Guniting concrete surface with cement mortar applied with compressor after cleaning surface and spraying with epoxy complete as per Technical specification. (Thickness 25mm)	sqm	1351
6.4	Providing and inserting nipples with approved fixing compound after drilling holes for grouting as per Technical specifications including subsequent cutting/removal and sealing of the hole as necessary of nipples after completion of grouting with Cement/Epoxy	each	164
6.5	Sealing of cracks/porous concrete by injection process through nipples/Grouting complete as per Technical specification.		
A	Cement Grout	kg	93
B	Cement mortar (1:1) Grouting	kg	172
6.6	Patching of damaged concrete surface with polymer concrete and curing compounds, initiator and promoter, available in present formulations, to be applied as per instructions of manufacturer and as approved by the Engineer. (Av. thickness 25mm)	sqm	2426
6.7	Sealing of crack / porous concrete with Epoxy Grout by injection through nipples complete as per specifications..	kg	1612
6.8	Applying epoxy mortar over leached, honey combed and spalled concrete surface and exposed steel reinforcement complete as per Technical specification section 2804 (10mm thick epoxy mortar)	sqm	796

Item No.	Descriptions	Unit	Rate (Rs)
6.9	Removal of defective concrete, cleaning the surface thoroughly, applying the shotcrete mixture mechanically with compressed air under pressure, comprising of cement, sand, coarse aggregates, water and quick setting compound in the proportion as per clause 2807.1., sand and coarse aggregates conforming to IS: 383 and table 1 of IS: 9012 respectively, water cement ratio ranging from 0.35 to 0.50, density of gunite not less than 2000 kg/cum, strength not less than 25 Mpa (40mm average thickness).	sqm	1332
6.10	Applying pre-packed cement based polymer mortar of strength 45 Mpa at 28 days for replacement of spalled concrete(thickness 10mm)	sqm	200
6.11	Epoxy bonding of new concrete to old concrete	sqm	1218
6.12	Providing external prestressing with high tensile steel wires/strands including drilling for passage of prestressing steel, all accessories for stressing and stressing operation and grouting complete as per drawing and Technical specification section 2812.		
A	For span = 25 m (4 no. of cables and 8 no anchorage)	tonne	365915
B	For span = 50 m (4 no.of cables and 8 no anchorage)	tonne	349432
C	For span = 100 m (6 no of cables and 12 no anchorage)	tonne	318394
6.13	Replacement of bearings complete as per Technical specification section 2810 (the work entails replacement of all the bearings on one site of span)	each	45829
6.14	Replacement of Expansion Joints complete as per drawings (Removal of old expansion joint)	meter	3549
6.15	Replacement of damaged concrete railing (Dismantling the old railing and disposal of dismantled material)	meter	2035
6.16	Replacement of damaged mild steel railing (Dismantling of old railing and disposal of dismantled material)	meter	3145
6.17	Repair of concrete crash barrier with cement concrete of M-30 grade by cutting and trimming the damaged portion to a regular shape, cleaning the area to be repaired thoroughly, applying cement concrete after erection of proper form work	meter	194
6.18	Repair of R.C.C. railing : Carrying out repair of RCC M-30 railing to bring it to the original shape	meter	129
6.19	Repair of steel railing: Repair of steel railing to bring it to the original shape (It is assumed that damage to the steel railing is to the extent of 10 percent.)	meter	282

STANDARD TABLE AND USEFUL DATA

FIELD LABORATORY EQUIPMENT

Clause 120.4

Table 100-2 List of Laboratory Equipment

A)	GENERAL		
1)	Weigh Balances		
	a)	5 – 20 kg capacity Electronic type – Accuracy 1 gm	1 No.
	b)	500 gm capacity-Electronic Type Accuracy 0.01 gm	1 No.
	c)	Electronic 5 kg capacity Accuracy 0.5 gm	1 No.
	d)	Platform Balance scale-300 kg capacity	1 No.
	e)	Chemical Balance 100 gm capacity-accuracy 0.001 gm	--
2)	Oven-electrically operated, thermostatically controlled (including thermometer), stainless steel interior		
	From 0°C to 220°C Sensitivity 1°C		1 No.
3)	Sieves : as per IS:460-1962		
	a)	I.S. sieves 450 mm internal dia of sieve sets as per BIS of required sieve sizes complete with lid and pan	1 set
	b)	IS sieve 200 mm internal dia (brass frame and steel/or brass wire cloth mesh) consisting of sieve sets of required sieve sizes complete with lid	2 sets
4)	Sieve shaker capable of asking 200 mm and 450 mm dia sieves-electrically operated with time switch		1 No.
5)	200 tonnes compression testing machine		1 No.
6)	Stop watches 1/5 sec. accuracy		1 No.
7)	glassware comprising beakers, pipettes, dishes, measuring cylinders (100 to 1000 cc Capacity)glass rods and funnels, glass thermometers range 0°C to 100°C and metallic thermometers range up to 300°C.		2No. each
8)	Hot plates 200 mm dia (1500 watt.)		1 No.
9)	Enamel trays		
	a)	600 mm x 450 mm x 50 mm	2 Nos
	b)	450 mm x 300 mm x 40 mm	2 Nos
	c)	300 mm x 250 mm x 40 mm	2 Nos
	d)	Circular plates of 250 mm dia	2 Nos
10)	Water Testing Kit		1 No
B)	FOR SOILS		
1)	Water still		
2)	Liquid limit device with ASTM grooving tools as per IS:2720		1 No.
3)	Sampling pipettes fitted with pressure and suction inlets, 10 ml. Capacity		1 set
4)	Compaction apparatus (Proctor) as per IS:2720 (Part 7) complete with collar, base plate and hammer and all other accessories		1 No.
5)	Modified AASHTO Compaction apparatus as per IS:2720 (Part 8) 1974 or		1 No

	Heavy Compaction Apparatus as per IS complete with collar, base plate hammer and all other accessories	
6)	Sand pouring cylinder with conical funnel and tap and complete as per IS:2720 (Part 28) 1974 including modern equipment.	2 Nos.
7)	Ignore Standard Sand	As required
8)	Sampling tins with lids 100 mm dia x 75 mm ht. ½ kg capacity and miscellaneous items like moisture tins with lid 50 grams etc.	4 Nos.
9)	Lab CBR testing equipment for conducting CBR testing, load frame with 5 Tonne capacity, electrically operated with speed control as per IS:2720 (Part 16) and consisting of following:	1 set
	a) CBR moulds 150 mm dia – 175 mm ht.	6 No.
	b) Tripod stands for holding dial gauge holder	4 Nos.
	c) CBR plunger with settlement dial gauge holder	1 No.
	d) Surcharge weight 147 mm dia 2.5 kg. wt.	2 Nos.
	e) Spacers disc 148 mm dia 47.7 mm ht. With handle	6 Nos.
	f) Perforated plate (Brass)	2 Nos.
	g) Soaking tank for accommodating 6 CBR moulds	2 Nos.
	h) Proving rings of 1000 kg, 2500 kg capacity	1 No each
	i) Dial gauges 25 mm travel – 0.01 mm/division	2 Nos.
10)	Standard penetration test equipment	1 No.
11)	Nuclear moisture Density meter or equivalent	-
12)	Speedy moisture meter complete with chemicals	1 No.
13)	Unconfined Compression Test Apparatus	1 No.
C)	FOR BITUMEN AND BITUMINOUS MIXES	
1)	Constant temperature bath for accommodating bitumen test specimen, electrically operated, and thermostatically controlled (to accommodate minimum six Specimens)	1 No.
2)	Penetrometer automatic type, including adjustable weight arrangement and needles as per IS:1203-1958	1 No.
3)	Soxhlet extraction or centrifuge type apparatus complete with extraction thimbles with solvent and filter paper	1 No.
4)	Bitumen laboratory mixer including required accessories (20 ltrs.)	1 No.
5)	Marshall compaction apparatus automatically operated as per ASTM 1559-62 T complete with accessories (with 180 N Marshall Moulds)	1 set
6)	Furol viscometer	1 No.
7)	Ductility meter	1 No.
8)	Softening point (Ring and ball app)	1 No.
9)	Distant reading thermometer	-

10)	Rifle box	1 No.
11)	Automatic Asphlat content Meter	1 No.
12)	Thin film over test apparatus for modified binder either with PMB or CRMB	-
13)	Mastic Asphalt Hardness testing equipment	-
14)	Sand Equivalent test apparatus	1 set
15)	Core cutting machine suitable for upto 150 mm dia core	1 set
16)	Thermometers	4 Nos.
D)	FOR CEMENT, CEMENT CONCRETE AND MATERIALS	
1)	Water still	
2)	Vicat needle apparatus for setting time with plungers as per IS:269-1967	1 No.
3)	Moulds	
	a) 150 mm x 300 mm ht. Cylinder with capping component along with the capping set and compound as per IS	As req.
	b) Cube 150 mm, and 100 mm (each size)	As req.
4)	Concrete permeability apparatus	
5)	High frequency mortar cube vibrator for cement testing	
6)	Concrete mixer power driven, 1 cu.ft. capacity	
7)	Variable frequency and amplitude vibrating table size 1 m x 1 m as per the relevant British Standard	
8)	Flakiness index test apparatus	1 No.
9)	Aggregate impact test apparatus as per IS:2386 (Part 4) 1963	1 No.
10)	Los-angeles abrasion test apparatus as per IS:2386 (Part 4) 1963	1 No.
11)	Flow table as per IS:712-1973	-
12)	Equipment for slump test	1 No.
13)	Equipment for determination of specific gravity or fine and coarse aggregate as per IS:2386 (Part 3) 1963	1 No.
14)	Compression and Flexural strength testing achine of 200 T capacity with additional dial for flexural testing	1 No.
15)	Core cutting machine with 10 cm dia diamond cutting edge	1 No.
16)	Needle vibrator	2 Nos.
17)	Air entrainment meter	-
18)	0.5 Cft, 1 Cft cylinder for checking bulk density of aggregate with tamping rod.	As req.
19)	Soundness testing apparatus for cement (Lee chattlier)	1 set
E)	FOR CONTROL OF PROFILE AND SURFACE EVENNESS	
1)	Total Statoin	1 No.
2)	Precision automatic level with micrometer attachment	1 set
3)	Distomat or equivalent	1 set
4)	Theodolite – Electronically operated with computerized output attachment	1 set
5)	Precision staff	2 sets
6)	3 meter straight edge and measuring wedge	1 set
7)	Camber template 2 Lane	

	a) Crown type cross-section	1 set
	b) Straight run cross-section	2 sets
8)	Steel tape	
	a) 5 m long	2 Nos.
	b) 10 m long	2 Nos.
	c) 20 m long	2 Nos.
	d) 30 m long	2 Nos.
	e) 50 m long	1 No.
9)	Roughometer (Bump Integrator)	1 No. (when required)

Note: The items and their number listed above in this Section are indicative and shall be decided by the Engineer as per requirements of the Project and modified accordingly.

MATERIAL FOR STRUCTURE
TABLE 1000-1
GRADING REQUIREMENTS OF COARSE AGGREGATE

IS Sieve Size	Percentage passing for graded aggregate of Nominal Size		
	40 mm	20 mm	12.5 mm
63 mm	-	-	-
40 mm	95-100	100	-
20 mm	30 -70	95-100	100
12.5 mm	-	-	90-100
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

TABLE 1000-2
GRADING REQUIREMENTS OF FINE AGGREGATE

IS Sieve Size	Per cent by Weight Passing the Sieve		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90 - 100	90 - 100	90 - 100
2.36 mm	60 - 95	75 - 100	85 - 100
1.18 mm	30 - 70	55 - 90	75 - 100
600 micron	15 - 34	35 - 59	60 - 79
300 micron	5 - 20	8 - 30	12 - 40
150 micron	0 - 10	0 -10	0 - 10

GRADES OF REINFORCING BARS
MATERIAL FOR STRUCTURE
TABLE 1000-3
STEEL

Grade Designation	Bar Type conforming to governing IS Specification	IS Characteristic Strength f_y MPa	Elastic Modulus GP
Fe 240	IS : 432 Part I Mild Steel	240	200
Fe 415	IS: 1786 High Strength Deformed Bars (HSD)	415	200
Fe 500 or Fe 500D	IS: 1786 High Strength Deformed Bars (HSD)	500	200
Fe 550 or Fe 500D	IS: 1786 High Strength Deformed Bars (HSD)	550	200
Fe 600	IS: 1786 High Strength Deformed Bars (HSD)	600	200

Note: If any grade of steel given in the above table is not available steel of next higher grade may be used.

Additional requirements for the use of such reinforcement bars are given below:

- (a) Patch Up materials shall be procured in sealed containers with certificates from the agency who has supplied the fusion bonded epoxy bars.
- (b) PVC coated G.I. binding wires of 18G shall only be used in conjunction with fusion bonded epoxy bars.
- (c) Chairs for supporting the reinforcement shall also be of fusion bonded epoxy coated bars.
- (d) The cut ends and damaged portions shall be touched up with repair patch up material.
- (e) The bars shall be cut by saw-cutting rather than flame cutting.
- (f) While bending the bars, the pins of work benches shall be provided with PVC or plastic sleeves.
- (g) The coated steel shall not be directly exposed to sun rays or rains and shall be protected with opaque polyethylene sheets or such other approved materials.
- (h) While concreting, the workmen or trolleys shall not move directly on coated bars but shall move only on wooden planks placed on the bars.

1010 WATER

- (a) To neutralize 100 ml sample of water, using phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NaOH.
For details of test refer IS:3025(Part 22).
- (b) To neutralize 100 ml sample of water, using mixed indicator, it should not require more than 25 ml of 0.02 normal. H_2SO_4 . For details of test refer IS:3025(Part 23).
- (c) The Permissible limits for solids shall be as follows:

	Tested as per	Permissible Limits (max)
Organic	IS:3025 (Pt. 18)	200 mg/lit
Inorganic	IS:3025 (Pt. 18)	3000 mg/lit
Sulphates (SO_3)	IS:3025 (Pt. 28)	400 mg/lit
Chlorides (Cl)	IS:3025 (Pt. 32)	2000 mg/lit for concrete work not containing embedded steel and 500 mg/lit for prestressed/reinforced concrete work.
Suspended matter	IS:3025 (Pt. 17)	2000 mg/lit

All samples of water (including potable water) shall be tested and suitable measures taken where necessary to ensure conformity of the water to the requirements stated herein.

- (d) The pH value shall not be less than 6.

1012.3 CHEMICAL ADMIXTURES

1012.3.1 General

- a) Normal dosage and detrimental effects, if any, of under dosage and over dosage.
- b) The chemical names of the main ingredients in the admixtures.
- c) The chloride content, if any, expressed as a percentage by the weight of the admixture.
- d) Values of dry material content, ash content and relative density which can be used for Uniformity Tests.
- e) Whether it leads to the entertainments of air when used as per the manufacturer's recommended dosage, and if so to what extent.
- f) Confirmation regarding its compatibility with type of cement.
- g) Whether it increases in the in risk of corrosion of the reinforcement or other embedments.
- h) Whether it affects the durability of concrete adversely.

1012.3.2 Physical and Chemical Requirements

- (a) " Plasticisers " and "Super-Plasticisers" shall meet the requirements indicated for "Water reducing Admixture"
- (b) Except where resistance to freezing and thawing and to disruptive action of deicing salts is required, the air content of freshly mixed concrete in accordance with the pressure method given in IS:1199 shall not be more than 2 per cent higher than that of the corresponding control mix and in any case not more then 3 per cent of the test mix.
- (c) The chloride content of the admixture shall not exceed 0.2 per cent when tested in accordance with IS:6925. In addition, the maximum permissible limit of chloride content of all the constituents as indicated in Section 1700 of these specification shall also not be exceeded.
- (d) Uniformity tests on the admixtures are essential to compare qualitatively the composition of different samples taken from batch to batch or from the same batch at different times.
The tests that shall be performed along with permissible variations are as follows:
 - Dry Material Content : Within 3 percent and 5 percent of liquid and solid.
 - Ash content : Within 1 per cent of the value stated by the manufacturer.
 - Relative Density (for liquid admixtures): Within 2 per cent of the value stated by the manufacturer.
- (e) All tests relating to the concretes admixtures shall be conducted periodically at an independent laboratory and the results compared with the data given by the manufacturer.

PILE FOUNDATIONS
1104.2 Concrete in Piles

Table 1100-1 : Requirements for Concrete in Piles

	Cast-in-situ Concrete by Tremie	Precast Concrete
Grade of concrete	M 35	M 35
Minimum cement content	400 kg/m ³	400 kg/ m ³
Minimum water cement ratio	0.4	0.40
Slump (mm) as measured at the time of placement	150-200	50 - 75

TABLE 1100-2

TIME FOR CURING PRECAST PILES

Type of Cement Used in Casting the Pile	Minimum Periods from Time of Casting			
	Strike Side-Shutters (Hours)	End of Wet Curing (Days)	Lift from Bed (Days)	Casting Drive (days)
Ordinary Portland	24	7	10	28
Rapid hardening Portland	12	7	7	10

1116 TOLERANCES

1116.1. Permissible Tolerances for Piles

i) Precast Concrete Piles :

- a) Variation in cross-sectional dimensions : ± 5 mm
- b) Variation in length : ± 25 mm
- c) Surface irregularities measured with 3 m straight edge : 5 mm
- d) Bow for total length of pile in mm : 1 mm/m length of pile limited to 20 mm

ii) Driven Piles

- a) Variation in cross-sectional dimensions : + 50 mm, - 10 mm
- b) Variation from vertical for vertical piles : 1 in 150
- c) For vertical piles deviation at piling platform level : 75 mm
- d) Variation of level of top of piles : ± 25 mm

iii) Bored Piles

- a) Variation in cross-sectional dimensions : + 50 mm, - 10 mm
- b) Variation from vertical for vertical piles : 1 in 150
- c) For vertical piles deviation at piling platform level : 75 mm
- d) Variation of level of top of piles : ± 25 mm

- iv) For raker piles from specified rake : 1 in 25

1116.2. Permissible Tolerances for Pile Caps

a)	Variation in dimensions	: + 50mm, -10 mm
b)	Misplacement from specified position in plan	: 15 mm
c)	Surface irregularities measured	: 5 mm with 3 m straight edge
d)	Variation of level of top of piles	: $\pm$ 25 mm

1508. REMOVAL OF FORMWORK

The scheme for removal of form work (i.e. de-shuttering and de-centering) shall be planned in advance and furnished to the Engineer for scrutiny and approval. No formwork or any part thereof shall be removed without prior approval of the Engineer.

The Formwork shall be so removed as not to cause any damage to concrete. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually to avoid any shock or vibration.

Form work shall not be released unless the concrete has achieved strength of at least twice the stress the concrete may be subjected at the time of the removal of formwork. When no test is conducted for determination of strength of concrete and where the time removal of formwork is not specified, the same shall be as under:-

a)	Walls, piers, abutments, columns and vertical faces of structural members	:	12 to 48 hours as may be decided by the Engineer
b)	Soffits of Slabs (with props left under)	:	3 days
c)	Props left under slabs	:	14 days
d)	Soffits of Girders (with props left under)	:	7 days
e)	Props (left under girders)	:	21 days

Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as soon as possible after the concrete has set, in order to avoid cracking due to shrinkage of concrete.

STRUCTURAL CONCRETE
1703. GRADES OF CONCRETE

TABLE 1700-1.

Type of concrete/Grade Designation			Characteristic Strength in MPa
Nominal Mix Concrete	Standard Concrete	High Performance Concrete	
M 15	M 15		15
M 20	M 20		20
	M 25		25
	M 30	M 30	30
	M 40	M 35	35
	M 45	M 40	40
	M 50	M 45	45
		M 50	50
		M 55	55
		M 60	60
		M 65	65
		M 70	70
		M 75	75
		M 80	80
		M 85	85
		M 90	90

TABLE 1700-2 :

Requirement of Concrete for Different Exposure condition using 20 mm Aggregate

Exposure Condition	Maximum Water Cement Ratio	Minimum Cement Content, kg/m ³	Minimum Grade of Concrete
Moderate	0.45	340	M 25
Severe	0.45	360	M 30
Very Severe	0.40	380	M 40

Note:

- i) All three provisions given in the above table for a particular exposure condition, shall be satisfied.
- ii) The term cement for maximum w/c ratio and minimum cement content shown in Table includes all cementitious materials mentioned granulated blast furnace slag in the blended cement shall be as specified in IS:1489 (Part 1) and IS:455 respectively.
- iii) For plain cement concrete, with or without surface reinforcement, the minimum grade of concrete can be lowered by 5 MPa and maximum water/ cement ratio exceeded by 0.05.

Cement content shown in the above table shall be increased by 40 kg/m³ for use of 12.50 mm nominal size aggregates and decreased by 30 kg/m³ for use of 40 mm nominal size aggregates.

TABLE 1700-3
Requirement of Concrete Exposed to Sulphate Attack

Class	Concentration of Sulphates as SO ₃			Type of Cement (Note II)	Minimum Cement Content, kg/m ³	Maximum Water/ Cement Ratio	Minimum Grade of Concrete
	In Soils		In Ground Water, g/l				
	Total SO ₃ %	SO ₃ in 2:1 Water: Soil Extract, g/l					
1)	Traces	< 1.0	< 0.3	-OPC, PPC or PSC	280	0.5	M25
2)	2.0 to 0.5	1.0 to 1.9	0.3 to 1.2	-OPC, PPC or PSC -SRPC	330	0.5	M25
3)	0.5 to 1.0	1.9 to 3.1	1.2 to 2.5	-SRPC, -PPC or PSC	330 350	0.5 0.45	M25 M30
4)	1.0 to 2.0	3.1 to 5.0	2.5 to 5.0	-SRPC	370	0.45	M35
5)	>2.0	>5.0	>5.0	-SRPC with protective coatings	400	0.4	M40

Note:

If the requirements of maximum water/cement ratio, minimum grade of concrete and minimum cement content from other durability considerations as given in Table 1700-2 are more stringent than those given in this table, then the former will govern.

OPC: Ordinary Portland Cement, PPC: Portland Pozzolona Cement. PSC: Portland Slag Cement, SRPC: Sulphate Resisting Portland Cement.

The minimum cement content shall be as low as possible but not less than the quantities specified in Table 1700-2 and 1700-3.

The maximum cement content excluding any mineral admixtures (Portland cement component alone) shall not exceed 450 kg/cu.m.

1704.1. Requirements of Consistency**Table 1700-4.**

	Type	Slump(mm) (at the time of placing of concrete)
1)	(a) Structures with exposed inclined surface requiring low slump concrete to allow proper compaction	25
	(b) Plain cement concrete	25
2)	RCC structures with widely spaced reinforcements; e.g. solid columns, piers, abutments, footings, well steining	40 - 50
3)	RCC structures with fair degree of congestion of reinforcement; e.g. pier and abutment caps, box culverts well curb, well cap, walls with thickness greater than 300 mm	50 - 75
4)	RCC and PSC structures with highly congested reinforcements e.g. deck slab girders, box girders, walls with thickness less than 300 mm	75 - 125
5)	Underwater concreting through tremie e.g. bottom plug, cast-in-situ piling	150 - 200

1704.2 Requirements for Designed Mixes**1704.2.1 Target mean Strength**

- (i) The Current margin for a concrete mix shall be determined by the Contractor and shall be taken as 1.64 times the standard deviation of sample test results taken from at least 40 separate batches of concrete of nominally similar proportions produced at site by the same plant under similar supervision, over a period exceeding 5 days, but not exceeding 6 months.

- (ii) Where there is insufficient data to satisfy the above, the current margin for the initial design mix shall be taken as given in Table 1700-5 :

Concrete Grade	Current Margin (MPa)	Target Mean Strength (MPa)
M 15	10	25
M 20	10	30
M 25	11	36
M 30	12	41
M 35	12	47
M 40	12	52
M 45	13	58
M 50	13	63
M 55	14	69
M 60	14	74
M 65	15	80
M 70	15	85
M 75	15	90
M 80	15	95
M 85	16	101
M 90	16	106

1704.2.3 Control of Strength of design mixes

a) **Adjustment to Mix Proportions.**

Adjustment to mix proportions arrived at in the trial mixes shall be made subject to the Engineer's approval, in order to minimize the variability of strength and to maintain the target mean strength. Such adjustments shall not be taken to imply any change in the current margin.

b) **Change of Current Margin**

When required by the Engineer, the Contractor shall recalculate the current margin in accordance with Clause 1704.2.1 The recalculated value shall be adopted as directed by the Engineer, and it shall become the current margin for concrete produced thereafter.

c) **Additional Trial Mixes**

In case any changes are observed in the properties of fresh concrete and/or strength of hardened concrete on the basis of early age tests, additional mixes and tests shall be carried out during production, so as to control and bring the quality of concrete within acceptable limits. In case of any change in the source or properties of materials, the design of mix shall be established afresh.

TABLE - 1700-6
PROPORTION FOR NOMINAL MIX CONCRETE

Concrete Grade	Total Quantity of dry aggregate by mass per 50 kg of cement to be taken as the sum of individual masses of fine and coarse aggregates (kg)	Proportion of fine to Coarse aggregate (by mass)	Maximum Quantity of Water for 50 kg of Cement (Litres)	
			PCC	RCC
M 15	350	Generally 1:2, subject to upper limit 1:1:5 and lower limit of 1:2:5	25	
M 20	250		25	22

1706: Size on Coarse Aggregate
Table 1700- 7.

Components	Maximum Nominal Size of Coarse Aggregate (mm)
i) RCC well curb	20
ii) RCC/PCC well steining	40
iii) Well cap or Pile Cap Solid type piers and abutments	40
iv) RCC Work in girders, slabs, wearing coat, kerb, approach slab, hollow piers and abutments, pier/abutment caps, piles	20
v) PSC work	20
vi) Any other item	As specified by the Engineer

TABLE 1700 - 9
Minimum Frequency Of Sampling

Quantity of Concrete in work, m ³	No. of Samples
1 - 5	1
6 - 15	2
16 - 30	3
31 - 50	4
51 and above	4 plus one additional sample for each additional 50 m ³ or part thereof

2400 - SURFACE AND SUB-SURFACE GEOTECHNICAL INVESTIGATION

2405 – DETAILED INVESTIGATION FOR BRIDGE FOUNDATIONS RESTING ON ROCK

2406- BORING

2408 - METHODS OF SAMPLING

There are two types of sample viz. (a) Disturbed sample (b) Undisturbed sample. The usual methods for sampling conforming to IS : 1892 and IS:2132 are given below :-

Nature of Ground	Type of Sample	Method of Sampling
Soil	Disturbed	Hand Samples Auger Samples Shell Samples
	Undisturbed	Hand Samples Tube Samples
Rock	Disturbed	Wash Samples from percussion or rotary drilling
	Undisturbed	Cores

TABLE 2400-2 SIZE OF SOIL SAMPLE REQUIRED

S.NO.	PURPOSE OF SAMPLE	SOIL TYPE	WEIGHT OF SAMPLE REQUIRED Kg.
1.	Soil identification, natural moisture content tests, mechanical analysis and index properties, chemical tests	Cohesive soils Sands and Gravels	1 3
2.	Compression tests	Cohesive soils and sand	12.5
3.	Comprehensive examination of construction material any borrow area soil including soil stabilization	Cohesive soils sands Gravelly soil	25 - 50 50 - 100

2413- TESTING OF MATERIAL FOR FOUNDATION OF GUIDE BUNDS AND HIGH EMBANKMENTS

TABLE 2400-3 SHEAR STRENGTH TESTS FOR STABILITY ANALYSIS

S. No.	Stage in Life of Embankment	Strength Parameters	Shear Test	Type of Analysis
1)	(a) During construction or immediate post-construction	c_{uu}, ϕ_{uu}	Unconsolidated undrained triaxial shear test on undisturbed samples and on compacted embankment material	Total stress analysis
	(b) -- do --	S_u	Unconfined compression test in laboratory or vane shear test	-- do --
	(c) -- do --	$C \phi$	Consolidated undrained test with pore-pressure measurement on as compacted soil samples of embankment materials and on undisturbed samples	Effective stress analysis
2)	Long term stability	$C \phi$	-- do --	-- do --

USEFUL DATA

1. Areas & Weights of Steel

a) Mild Steel Round Bars

Dia in mm	Area Sq. cm.	Weight Kg/M	Perimeter Cms.
6	0.283	0.222	1.887
8	0.503	0.395	2.514
10	0.785	0.617	3.143
12	1.131	0.888	3.771
16	2.011	1.578	5.028
18	2.545	2.000	5.657
20	3.142	2.466	6.286
22	3.801	2.984	6.914
25	4.909	3.853	7.857
28	6.157	4.830	8.800
32	8.042	6.313	10.057
40	12.566	9.684	12.571

b) High Tensile Steel

Dia in mm	Area Sq. cm.	Weight Kg/M	Perimeter Cms.
3	0.070	0.056	0.943
5	0.196	0.154	1.571
7	0.385	0.302	2.200
8	0.503	0.395	2.514

c) **H.T. Cables each containing 12 wires**

Dia of wire in mm	Total area of H.T. Sq. Cm.	Weight Kg/M
3	2.352	1.848
5	4.620	3.624
8	6.036	4.740

d) **Structural steel** (Sections which are normally required in bridge works)

Types Section	Size in M.M.	Weight Kg./M.
Angle	40 x 40 x 6	3.500
	50 x 50 x 6	4.500
	75 x 75 x 6	6.800
	75 x 75 x 10	11.000
	100 x 100 x 6	11.000
	100 x 100 x 10	14.900
	130 x 130 x 10	19.700
	130 x 130 x 12	23.400
	Tee 100 x 100 x 10	15.00
	Channel 75 x 40 x 6	5.700

f) **Structural Flats** (Sections which are normally required in bridge works)

g)

Thickness of Plate	Weights Kg./M.
1 M.M.	0.00078
2 M.M.	0.00156
3 M.M.	0.00235
6 M.M.	0.00470
10 M.M.	0.00783
12 M.M.	0.00940
20 M.M.	0.01566
25 M.M.	0.01957

2. Weight of Materials for construction (as per IS:875 (Part I) 1987)

S.No.	Material	Unit Metric	Weights in Kg.
1.	Cement	Cum.	1440
2.	Steel		
	a) Mild Steel	Cu.Cm.	0.0078
	b) Cast Steel	Cu.Cm.	0.0078
	c) H.T. Steel	Cu.Cm.	0.0078
3.	Stainless Steel	Cu.Cm.	0.0078
4.	Lead	Cu.Cm.	0.0113
5.	Copper	Cu.Cm.	8.79 to 8.94
6.	Plain Cement Concrete	Cum.	1600 to 2400
7.	PSC	Cum.	2400
8.	RCC	Cum.	2310 to 2700
9.	Stones		
	a) Lime	Cum.	2400 to 2640
	b) Sand	Cum.	2240 to 2400
10.	Stone Masonry Rubble	Cum.	2100
11.	Bricks	Cum.	1600 to 1920
12.	Brick Masonry	Cum.	1920 to 2240
13.	Timber	Cum.	650 to 720

3. Conversion Factors.

Top Convert	Into	Multiply by	
Inch	Millimeter	25.40	0.039
Inch	Centimeter	2.540	0.3937
Foot	Meter	0.3048	3.2808
Mile	Kilometer	1.609	0.621
Square Inch	Sq. Centimeter	6.4516	0.155
Square Foot	Square Meter	0.0929	10.764
Acre	Hectare	0.4047	2.471
Sq. Mile	Sq. Kilometer	2.590	0.386
Cubic Inch	Cu. Centimeter	16.387	0.0161
Cubic Foot	Cubic Meter	0.0283	35.3147
Gallon (Imp.)	Litre	4.546	0.220
Pound	Kilogram	0.4536	2.2046
Ton	Tonne	1.0160	0.9842
Lbs. Per Sq. Inch	Kg. Per Sq. Cm.	0.0703	14.223
Ton Per Sq. Foot	Tonne Per Sq. M.	10.937	0.0914
To obtain	From		Multiply by

4. Quantities of Materials for Finished Items of Works

S.No	Items		Materials	Quantities
a)	Unit per Cubic meter of finished item			
1.	Cement Mortar (1:3)		Cement Sand	0.33 Cum. 1.00 Cum.
2.	Cement Mortar (1:4)		Cement Sand	0.25 Cum. 1.00 Cum.
3.	Cement Mortar (1:6)		Cement Sand	0.16 Cum. 1.00 Cum.
4.	Course Rubble Masonry		Stones Mortar	1.00 Cum 0.33 Cum
5.	Cut Stone Masonry		Stone Mortar	1.00 Cum. 0.16 Cum.
6.	Fine Ashlars Stone Masonry		Stone Mortar	1.0 Cum. 0.12 Cum.
b)	Unit per Sq. Meter of finished item			
7.	Flush pointing to stone work		Mortar	0.004 Cum.
8.	Truck Pointing of stone work		Mortar	0.008 Cum.

UNITED WEIGHT OF MATERIALS USED AT CONSTRUCTION SITE

Following table shows unit weight of materials used at construction site. Please note this is for reference purpose only and may vary from place and type of material.

S.No	Material	Theoretical Weight in(KG/M³)	Approx Weight at Site in		Remarks
			Kg	Per	
1	Cement	1440	50	Bag	
2	Steel	7850	d ² /162		d -dia in mm
3	Sand-				
	Dry	1600	50 to 55	farma	1 farma=1.25cft
	River	1840	57 to 63	farma	1 farma=1.25cft
4	Stone(basalt)	2850 to 2960	48 to 52	farma	metal 12mm to 20mm
5	Water	1000	1	liter	
6	PCC	2240	8.24 to 8.5	Cube mould	cube mould size=15x15x15cm
7	RCC 2% Steel	2420			
8	Bricks	1600 to 1920	1.9 to 2	no	9x4x2 3/4"
			4.8 to 4.9	no	9x6x3 3/4"
9	Brick Masonry	1920			
10	Soil(damp)	1760	50 to 55	cft	Black cotton
11	Cement concrete block(solid)	1800	18 to 20	cft	30x15x20 cm
			10 to 11	no	30x10x20 cm
12	Cement Mortar	2080	57 to 62	cft	
13	Lime Mortar	1760	48 to 52	cft	
14	Lime	640	30	bag	
15	Glass	2530	0.9 to 0.95	sft	4mm tk plain
16	Teak Wood	670 to 830	18 to 20	cft	
17	Sal Wood	990	22 to 24	cft	
18	Marble mosaic tile		2.8 to 3.2	no	25x25x22mm
			4.8 to 5.2	no	30x30x25mm
19	Chequered tile		2.5 to 2.8	no	25x25x22mm
20	Glazed tile15x15cm		0.20 to 0.25	no	5mm tk
21	Marble Stone	2620	5.1	sft	3/4"tk
22	Granite Stone	2460-2800	5.35	sft	3/4"tk
23	Coddappa	2720	6.4	sft	1 1/4"tk
24	A.C.sheet corrugated	16	1.2	sft	
25	Bitumen	1040	220	Drum	200liter drum
26	Window frame (simple design)		1.9 to 2.1	sft	
27	Door Frame				
	a)3'00"x7'0		25 to 27	no	section 4"x2 1/2"
	b)2'6"x7'0		24 to 26	no	section 4"x2 1/2"