



GOVERNMENT OF CHHATTISGARH WATER RESOURCES DEPARTMENT

SCHEDULE OF RATES FOR

WORKS OF WATER RESOURCES DEPARTMENT CHHATTISGARH

In Force From
1st May 2025

Issued by

Engineer-in-Chief

Water Resources Department Chhattisgarh
Nava Raipur

Price : ₹ 600

बस्तरः जलप्रपातों की प्राकृतिक सौगात

बस्तर चित्रकोट, तीरथगढ़, मेंद्री घूमर और
हांदावाड़ा जैसे जलप्रपातों के लिए प्रसिद्ध है।
यहां की भौगोलिक बनावट और नदियाँ
जलप्रपातों को सालभर बहने
वाला बनाती हैं।



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PREFACE

A Standard Data Unit Rate Analysis, primarily based on manual labour, was first introduced in the Water Resources Dept., State of Madhya Pradesh, in 1984. Since then, the Schedule of Rates (SOR) has undergone multiple revisions, with the last update before state formation occurring in 1998.

After the formation of Chhattisgarh State on 1st November 2000, the SOR used in Madhya Pradesh was initially adopted by the Water Resources Department, Chhattisgarh. Subsequently, a dedicated SOR for Water Resources works in Chhattisgarh was enforced from 1st December 2003. Typically, the Schedule of Rates is to be revised once every five years, with the last revision implemented on 1st August 2010.

Recognizing the advancements in construction technology, increasing labour wages, material costs and the growing use of machinery and equipment, a revision of the Schedule of Rates was long overdue. To enhance precision and comprehensiveness, this revised SOR will take effect from 1st May 2025.

Key Features of the Revised SOR 2025:

1. The Schedule of Rates has been developed using the "Standard Data Unit Analysis" methodology, which is uniformly followed by Central and State Government construction departments in Madhya Pradesh, Karnataka, Andhra Pradesh and Odisha.
2. The Rate Analysis of items considers the average market rates for materials across Chhattisgarh excluding Goods and Service Tax.
3. The Rate Analysis includes:
 - o Rates of materials, labour, machine & equipment hire charges, fuel charges, crew charges, and
 - o Contractor's profit, overhead charges, sundries and labour cess on a percentage basis.
4. The specifications of materials, workmanship, and quantities conform to Indian Standards (IS Codes), along with guidelines, circulars, and specifications issued by the Water Resources Department of Chhattisgarh.
5. The revised SOR incorporates modern construction technology to reflect industry advancements.
6. The structure of the SOR ensures that most items can be directly used in the Bill of Quantities (BOQ) without the need for clubbing.
7. Rates for buildings, roads, sanitation, water supply, closed pipe conduits, and electrification will be adopted from the latest SORs of the Chhattisgarh Public Works Department, Public Health Department, Rural Development Department, State Electricity Companies, and relevant Central Government agencies with applicable amendments.

With the highest regard, I acknowledge the exemplary vision, insightful leadership and steadfast commitment of **Shri Rajesh Sukumar Toppo, Secretary, Government of Chhattisgarh, Water Resources Department**. His strategic foresight and unwavering guidance have been instrumental in driving the successful revision of the SOR 2025. The achievement of this significant milestone stands as a testament to his enduring support and dedication.

A special appreciation goes to **Shri Alok Kumar Agrawal, Superintending Engineer (BODHI)**, Office of the Engineer-in-Chief, Water Resources Department, for his dedicated and tireless efforts in the preparation and finalization of this document. His technical expertise, commitment, and attention to detail have been instrumental in ensuring the accuracy and relevance of the revised SOR.

I also extend my sincere thanks to the following officials for their significant contributions in the finalization of SOR 2025:

- **Shri Sanjay Vasudeo Bhagwat**, Chief Engineer (Monitoring), Office of the Engineer-in-Chief, Water Resources Department, Nava Raipur
- **Shri Arun Kumar Badhiye**, Chief Engineer, State Dam Safety Organization, Office of the Engineer-in-Chief, Water Resources Department, Nava Raipur
- **Shri K.S. Guroower**, Chief Engineer, Mahanadi Project, Raipur
- **Shri Deepak Bummerkar**, Chief Engineer, Minimata (Hasdeo) Bango Project, Bilaspur
- **Shri R.K. Indwar**, Chief Engineer, Hasdeo Ganga Basin, Ambikapur
- **Shri S.K. Tikam**, Chief Engineer, Mahanadi Godavari Basin, Raipur

- **Shri A.K. Sai**, Chief Engineer, Hasdeo Basin, Bilaspur
 - **Shri K.S. Bhandari**, Chief Engineer, Water Resources Department, Jagdalpur
 - **Shri Prasun Kumar Sharma**, Superintending Engineer (Administration), Office of the Engineer-in-Chief, Water Resources Department, Nava Raipur
 - **Shri Sanjay Pathak**, Superintending Engineer, E/M Light Machinery Circle, Bilaspur
 - **Shri I. A. Siddiqui**, Superintending Engineer, Water Resources and Ground Water Circle, Raipur
 - **Shri Lalit Kumar Rawte**, Executive Engineer, Water Management Division No. 1, Raipur and **Shri Shashank Singh** Executive Engineer, Hasdeo Canal Water Management Division, Janjgir
- Additionally, this achievement would not have been possible without the dedicated efforts of:
- **Shri Ajay Shrivastava, Shri Satish Kumar Saraf, Shri Vijay Kumar Khare, Shri Kishor Chandra Sharma (Technical Advisors)**
 - **Shri Vikas Dubey Executive Engineer, Ms. Kalash Ramteke, Shri Devendra Sonkeware, Shri Ajeet Jangde, Shri Dinesh Kumar Sudhakar, Mrs. Purna Tiwari, Mrs. Homi Sahu (Assistant Engineers) Shri D.R. Vishwakarma (Assistant Technical Advisor)**

for their tireless efforts in compiling this edition of the SOR, who have worked continuously at SOR Wing of BODHI, Office of the Engineer-in-Chief, Water Resources Department, Raipur. Their commitment ensured the completion of this extensive work in a remarkably short time.

Last but not the least, I am thankful following to Engineers who have worked with dedication to bring out this SOR:

- **E/M Wing:** - Shri P. K. Pal Superintending Engineer, Shri Dinesh Singh Executive Engineer, Shri Akhilesh Dwivedi SDO, Shri Rakesh Vastrakar Assistant Engineer, Shri Surendra Patre Sub Engineer
- **Hydrometeorology Wing:** - Shri Jayant Bisen, Dy. Director Hydrometeorology Dn. No 4 Raipur, Shri Uttam Kumar Suraj SDO, Shri Apoorv Vishwakarma, Assistant Engineer
- **Bodhi Staff:** - Shri Deepak Maravi, Shri Tejanshu Sahu, Shri Amresh Jangde, Ms. Lata Dewangan, Shri Ashutosh Gaikwad, Shri Kamal Kishore Tandon, Shri Pratik Pateriya, Shri Nitish Kumar Jangde, Shri Ashish Kumar, Shri Yuvraj Diwan, Shri Yashab Mehto, Shri Bhishma Pitamah Yadav (Assistant Engineers), Shri Abhay Singh Assistant Draftsman

This SOR is expected to serve as a reliable guideline for the Water Resources Department and all associated stakeholders in achieving cost-effectiveness, quality assurance, and timely completion of infrastructure projects. It acts as a crucial reference for engineers, contractors, and other stakeholders involved in the implementation of irrigation, flood control, and water conservation projects. Any deviations or special cases should be addressed through proper administrative channels as per the department's guidelines.

Every effort has been made to ensure that this SOR 2025 is comprehensive, precise, and in line with modern construction standards. However, there is always scope for improvement. Suggestions for further enhancements are highly encouraged and will be sincerely considered for future revisions.

We hope that this Schedule of Rates 2025 will serve as a reliable and effective tool for the efficient execution of Water Resources projects across Chhattisgarh.

Lastly, I would also like to acknowledge the contributions made by many other officials and staff members of the Water Resources Department who have given assistance directly or indirectly in bringing out this publication.



(Indrajeet Uikey)
Engineer-in-Chief
Water Resources Department Chhattisgarh
Nava Raipur, Atal Nagar

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GENERAL INSTRUCTIONS

1	These general instructions apply to all chapters of Schedule of Rates to the extent they are relevant.
2	All materials to be used on work shall confirm to relevant specifications of Bureau of Indian Standards and specifications, circulars issued by CG Water Resources Department from time to time, unless otherwise specifically intended by the Department for specific purpose.
3	<ul style="list-style-type: none"> a) The rates in all items of this SOR are inclusive of all lead, lift and transportation of material except otherwise specified in the item. No extra amount on this account is payable unless otherwise specifically mentioned in any particular item. b) The rates for completed items are exclusive of GST. Applicable GST on total amount of civil contract shall be added on the base amount worked out as per SOR 2025. c) The rates for completed items also include the cost of material, labour, workmanship, quality assurance measures, field/ laboratory test, inspection, mix design, finishing, wastage, enabling work, loss on stocks, machinery, templates, tools and plants and other appliances etc. required for proper execution of work. It also covers provision for erection and removal of shuttering, scaffolding and ladders, protection of work during construction such as erosion and falling materials and other causes. d) The Annexure-I showing the quantity of materials for various items of work and Annexure- II showing transportation charges for general guidance only and for working out lead charges for specific requirement if any.
4	<p><u>Measurements:</u> Unless otherwise stated, hereafter all works shall be measured net in decimal system, as fixed in position as given below:</p> <ul style="list-style-type: none"> a) Each linear dimension shall be generally measured to the nearest 0.01 m or any other lesser units if specified. b) Area shall be generally worked out to the nearest 0.01 sqm or any other lesser units if specified. c) Cubical contents shall be generally worked out to the nearest 0.01 cum or any other lesser units if specified.

5	<p>The rates for completed items are:</p> <p>a) Inclusive of royalty charges of materials as per notification of Govt. of CG, Mining Department No. F-7-25/2012/12 dated 5-3-2018 Gazette and Excluding GST on commodities.</p> <p>b) Applicable GST on total estimated amount of civil work shall be added on the estimated amount worked out as per SOR 2025.</p>										
6	<p>The rates for completed items also include following:</p> <table> <tr> <td>a) Contractor's profit</td><td>10%</td></tr> <tr> <td>b) Contractor's overhead charges (annexure-XVI)</td><td>2.5%</td></tr> <tr> <td>c) Sundries</td><td>1.0%</td></tr> <tr> <td>d) <u>Labour cess</u></td><td><u>1.0%</u></td></tr> <tr> <td>Total</td><td>14.5%</td></tr> </table>	a) Contractor's profit	10%	b) Contractor's overhead charges (annexure-XVI)	2.5%	c) Sundries	1.0%	d) <u>Labour cess</u>	<u>1.0%</u>	Total	14.5%
a) Contractor's profit	10%										
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c) Sundries	1.0%										
d) <u>Labour cess</u>	<u>1.0%</u>										
Total	14.5%										
7	<p>(a) In general, the use of Muster Roll is prohibited. In special conditions the Government orders for use of N.M.R. (Nominal Muster Roll) shall be followed strictly. For execution of works on NMR the rates will be reduced by the element of contractor's profit and overhead charges (12.5%). Hence works executed on NMR should be $12.5 \times 100 / 114.5 = 10.91$ say 11% below schedule of rates. For awarding contracts on piecework, the deduction will be only 9.5% because there will be element of profit restricted to 3%. Hence work executed on piecework shall be $9.5 \times 100 / 114.5 = 8.30\%$ say 8% below schedule of rates. Prior sanction of competent authority as assigned by the Government shall be necessary for execution of works on NMR or piecework.</p> <p>Prior Sanction of Chief Engineer/Superintending Engineer shall be necessary for execution at higher rates.</p> <p>(b) If the piecework rates are sanctioned, the rates for execution on NMR shall be $(91.70 - 89.09) / 91.70 \times 100 = 2.61 \times 100 / 91.70 = 2.84\%$ say 3% below piecework rates.</p> <p>Similarly, if NMR rates are fixed the rates payable for execution on piecework shall be $(91.70 - 89.09) / 89.09 \times 100 = 2.61 \times 100 / 89.09 = 2.93\%$ say 3% above NMR rates.</p> <p>(c) The NMR/piecework rates arrived at in accordance with (a) & (b) above shall be rounded off to the nearest Rupees.</p>										
8	<p>The rates of completed items are inclusive of site clearance, haulage on roads, working under watery situation, de-silting but exclude dewatering and river diversion arrangement, wherever applicable.</p>										

9	Useful rubble, boulder and stone chips obtained from excavation shall be issued to the contractor for use on works (including enabling works and aggregate crushing) at the issue rates specified for those materials.
10	For rates of items not provided in the related chapter, the rates as provided in another chapter shall be adopted.
11	<p>a) The rates as provided in the schedule of rates of CGPWD/CGRRDA/ CGPHED/ CGUADD/ CG State Electricity Companies be adopted after ensuring deduction of taxes, for the items not found in this Schedule of Rates and the general instructions of respective SOR with specifications shall be followed. The guidelines/instructions for adoption of SOR item of other departments are enclosed as. Annexure-III</p> <p>b) The sequence of preference of SOR of other departments will be:</p> <ol style="list-style-type: none"> i. Departments of Govt. of CG. ii. Public sector organizations of Govt. of CG. iii. Central Govt. Departments iv. Public sector organizations of Central Govt. v. Departments of other State Govt. vi. Public sector organizations of other State Govt.
12	All steel shall be procured from an authorized dealer or original producers who Manufacture billets directly from iron ores and roll the billets to produce steel conforming to IS 1786. No re- rolled steel shall be used on the works.
13	The nomenclature of items given in the schedule of rates shall not be deviated and shall be followed as they are. It is important that the deviation can be done only for items, which do not find place in the schedule of rates with due permission from Engineer-in-Chief, CG Water Resources Department .
14	<p>a) Work shall be executed strictly in accordance with relevant IS Codes, IRC, MORTH, Technical circulars & specifications issued by C.G. Water Resources Department from time to time or specifications of relevant departments whose SOR items are used.</p> <p>b) Wherever any reference is made to any specified code in the schedule, it shall be taken as reference to the latest edition with all amendments issued.</p>
15	In the interpretation of description of items or rates in the SOR and specifications, the decision of the Engineer-in-Chief, WRD shall be final, unless otherwise specified.

16	The estimates for works shall be prepared on the basis of Schedule of Rates (SOR) for comparison of tendered rates with common datum throughout the department, without adding or subtracting anticipated tender rates.
17	Antiquities: - Any ancient carvings, relics of antiquity, coins or other curiosities which may be discovered or excavated are the property of Government and shall be delivered to the Engineer- in-Charge.
18	Any vegetation, earth, moorum, sand, gravel, stone, debris, bricks, brickwork, concrete, masonry etc., obtained from excavation shall form the property of the Government.
19	The rates given in the Schedule of Rates are in Indian Rupees and Paisa.
20	The sequence of construction of irrigation channel (s)/distribution networks shall be so planned that the work is completed from head to tail, including construction of all structures.
21	The horizontal (depth-wise or height-wise) splitting of work shall not be done. The sanction for longitudinal (length wise) splitting of work shall be accorded when considered desirable with due regard to junction with other group(s).
22	The items to be adopted for execution shall be based on design requirements and type of work, however in case of small works; nominal mix for concrete can be used, with prior written permission of Engineer-in-Charge, as per IS 456:2000(Reaffirmed 2011 Fourth Revision), clause 9.3 at the same rate of Design Mix, no extra payment shall be admissible.
23	Rates of material and machinery as adopted in analysis of items are enclosed in Annexure-IV , however no claim will be entertained during execution of works for variation with market rates.
24	The analysis of rates of completed items of works, having cement component has been worked out considering the use of Portland Pozzolana Cement confirming to IS 1489 part 1 & 2. Pozzolana cement is now being widely produced all over country. This may be used for canal lining and Hydraulic Structures in contact with water as per I.S. code. In specific cases requiring higher grade of strength, use of Ordinary Portland Cement (OPC) should be invariably ensured.
25	During execution of work all regulations, notifications, bye laws of Central, State Government and Local bodies shall be followed.

26	Options for masonry, concrete, plum concrete shall be decided by the Superintending Engineer considering availability of materials, skilled workers, cost implications etc., for all projects having “C” masonry sub-head of Rs. One Crore or more in all new projects/ordinary repair/special repair works.
27	The rates for completed Items are based on average rate for the whole state. In some parts of the state, the market rates may be high while in others these may be low. Therefore, the ruling rate for work on NMR/piecework will differ from region to region. The Chief Engineer / Superintending Engineer will announce in advance the percentage deduction (or addition) to the rate given in the schedule of rates for executing works on NMR and piecework contract. These rates will hold good for a whole working season i.e. October to September.
28	In compliance to above, the Chief Engineer / Superintending Engineer may announce percentage deductions (or additions) item wise (or chapter wise) and Division wise in respect of the items (or chapter) required to be executed on NMR/Piecework.
29	The copy of the sanction may be endorsed in the Water Resources Department besides officers of other departments as follows: <ul style="list-style-type: none"> • The Secretary, Water Resources Department, C.G. Raipur. • The Concerned Chief Engineers. • The Superintending Engineer, Bodhi O/o Engineer-in-Chief, Water Resources Department, C.G. Raipur • The Executive Engineers of the Circle (in 15 copies) for distribution to all concerned in division office. • All Sub-Divisional Officers (in 10 copies) for distribution to concerned staff including Sub-Engineers.
30	(a) The general rule of open tender system i.e. invitation of tenders by public advertisement shall be followed in respect of all works costing over Rs. 15,000. For awarding the work on piece work, instructions issued by the Govt. from time to time may be followed. (b) The horizontal (depth-wise or height-wise) splitting of work shall not be done for award or work on piecework. The sanction for longitudinal (lengthwise) splitting of work for piecework shall be accorded, when considered desirable, with due regards to junction with other group(s).
31	The contract agency, for earthwork and all structures (except direct outlets and railway crossings) on irrigation channels carrying discharge (a) below 0.3 cumec., may be fixed in one group and (b) 0.3 to 1 cumec (and also for 1 to 3 cumec) discharge may be fixed in one group or groups in multiple of 3k.m. length or for length as considered suitable
32	The labour rates are to be as per the rates fixed by the labour commissioner Chhattisgarh Raipur's order No. 8/MW/LC/2024/6211 Nava Raipur dated 25/09/2024 which are given below.

S.No.	Labour	Unit	Rate in Rs per month	Rate in Rs per day
1	Unskilled	1	10428.00	401.00
2	Semi-skilled	1	11078.00	426.00
3	Skilled	1	11858.00	456.00
4	Highly Skilled	1	12638.00	486.00
33	The labour rates adopted for preparation of SOR are inclusive of provision for weekend holiday.			
34	The royalty charges are taken in analysis of rates as per Government of Chhattisgarh mining department gazette notification no F-7-29/2012/12 Nava Raipur dated 05/03/2018.			
33	The labour rates adopted for preparation of SOR are inclusive of provision for weekend holiday.			
34	The royalty charges are taken in analysis of rates as per Government of Chhattisgarh mining department gazette notification no F-7-29/2012/12 Nava Raipur dated 05/03/2018.			
35	Rates as prevalent in April 2025.			
S.No.	Material	Unit	Rate in Rs.	
1.	Cement including cost of container (each bag will be deemed to contain 50 kg of cement).	Kg	5.35	
2.	Mild steel	Kg	62	
3.	Cold worked deformed bars	Kg	62	
4.	Structural steel	Kg	71	
5.	High tensile steel	Kg	62	
6.	Copper sheets 16 SWG	kg	1193	
7.	Electric detonator	each	40	
	Fuel			
8.	Diesel (march-2025)	Lit	93.39	
9.	Petrol (march-2025)	Lit	100.45	
If the issue rates of above materials/Fuels (S.No. 1 to 9) are higher than the rates given above, the provision for extra cost of these materials shall be made in the estimate. For percentage rate tender, the issue rate of cement shall be applicable as specified in schedule of rates.				

36	<p>Rates provided in the schedule are based on availability of water from tap or well or natural sources. If water is not available within 100-m provision shall be made in the estimate for lead of water as provided in the schedule. This will, however, not be payable on contract works (percentage rate tender or item rate tender or piecework or lump sum contracts) as a separate item.</p> <p>In case of item rate tenders, the provision made for extra water lead charges can be considered while arriving at the estimated rate of each item of the schedule of quantity of the items put to tender as this would not result in payment of extra water lead as a separate item.</p> <p>For example:</p> <p>(a) The steel reinforcement shall be of the type provided in the design, if not available the structure may be redesigned taking into consideration the stresses of the type of steel to be used so that permissible stresses may develop in concrete and reinforcement.</p> <p>(b) The circular issued by the Superintending Engineer, Bodhi O/o Engineer-in-Chief, Water Resources Department, Raipur regarding use of various types of strength concrete in foundation and super structure of dam, bridges, SOR provision specification should be followed. Strict quality control should be ensured. However, on small works nominal mix for concrete can be used, with prior written permission of the Chief Engineer / Superintending Engineer.</p> <p>(c) For buildings, the chimney burnt bricks involving longer leads shall be normally used only when design considerations warrant with the written permission of the Chief Engineer / Superintending Engineer.</p>
37	The controlled concrete of various grades (M15, M20, and M25) shall conform to IS: 456-2000 (third revision). Letter M refers to the mix and number to the specified characteristic compressive strength of 15-cm cube at 28 days, expressed in N / mm ² .
38	The estimates for works should be prepared on the basis of schedule of rates (S.O.R.) for comparison of tendered rates with common datum throughout the department.
39	Instructions issue wide EinC letter no. 34/Quality vigilance Squad /2018/19374 Raipur date 21,12,2018 should be followed while proposing/constructing Diaphragm wall .

CHAPTER 1

SURVEY AND INVESTIGATION

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour.
 - b) All materials required for execution of items of work.
 - c) All lead and lifts.
3. **Rate for drilling work includes:**
 - a) All lead and lifts of materials, machines and labours.
 - b) Cost of taking out cores, logging, labeling and preservation of cores, maintaining in serial order and painting depths on cores & core box and protection of drill holes till final measurements.
 - c) Water and air charges.
4. **Survey work:**
 - a) For chain and compass survey, the length of the survey will be measured along the lines on which particular type of survey is to be done. For example, for chain and compass survey, it would be the length along which the chaining and compassing is to be done. For levelling, it would be the total length of the lines along which levels are to be taken.
 - b) For topographical and cadastral survey by total station or through drones/LiDAR the area will be measured in hectares.
5. The rates are based on the following average daily progress that can be normally achieved under average conditions by one survey party:

Item	Head works	Canals
Chain and compass survey	2 km	3 km
Levelling (above 15 m interval)	2 km	2.5 km

- a) The labour strength of one survey party for chain and compass survey considered in (a) above is 12 mazdoors (3 for ranging, 1 for preparing pegs, 1 pegman, 2 chainmen, 1 compass man, 2 axe men for removing obstacles, 1 waterman and 1 watchman for watch and ward of camp).
- b) For leveling (above 15m interval) the labour strength considered is 8 mazdoors (2 chain and tape man, 1 staff man, 1 instrument man, 1 umbrella man, 1 waterman and 2 axe men for removing obstacles).
- c) In very difficult terrain and special circumstances where the progress may be less special sanction for the rate should be obtained from the Superintending Engineer and the provision for the same be made in the estimate.
- d) For total station survey party includes 9 persons (2 diploma holder surveyor, 2 prism holder (unskilled), 1 data composer, 2 instrument carrier/helper (unskilled), 1 umbrella and water man, 1 axe-man for clearing obstacles).

- e) For establishment of control points (both primary and secondary) through DGPS (Differential Global Positioning System), a total of 4 persons (1 DGPS operator (Expert), 1 DGPS helper (highly skilled), 1 water man, 1 umbrella man along with 0.25 Project manager (Highly Qualified Professional/expert for mission planning and overall project management) per day are required.
 - f) For drone based photogrammetry survey for item no. 1.116 (3.5 cm GSD) a total of 10 persons (01 DGPS operator (expert), 01 GIS photogrammetry expert (Expert), 01 GIS Database manager (Expert), 01 supervisor (Expert), 01 drone operator (Expert) , 01 CAD operator/draftsman (Highly Skilled), 01 DGPS helper (highly skilled), 01 Drone Helper (Skilled) , 01 umbrella man(unskilled) along with 01 Project manager (Highly Qualified Professional/expert for mission planning and overall project management) per day are required. This requires a total 08 days of Field and Data Processing duration making a total of 23 man-days input for the entire team.
 - g) For drone based photogrammetry survey for item no. 1.117 (2.5 cm GSD) a total of 11 persons (01 DGPS operator (highly skilled), 01 GIS photogrammetry expert (Expert), 02 GIS database manager (Expert), 01 supervisor (Expert), 01 drone operator (Expert), 01 CAD operator/draftsman (Highly Skilled), 01 DGPS helper (highly skilled), 01 Drone Helper (Skilled), 01 umbrella man(unskilled) along with 01 Project manager (Highly Qualified Professional/expert for mission planning and overall project management)) per day are required. This requires a total 08 days of Field and Data Processing duration making a total of 24.5 man-days input for the entire team.
 - h) For LiDAR survey & LiDAR + Photogrammetry survey (Light Detection and Ranging) for item no. 1.118 a total of 11 persons (01 DGPS operator (highly skilled), 01 LiDAR Data Processing Expert (Expert), 01 GIS & photogrammetry expert (Expert), 02 GIS Database manager (Expert), 01 supervisor (Expert), 01 drone operator (Expert) , 01 CAD operator/draftsman (Expert), 01 DGPS helper (highly skilled), 01 Drone Helper (Highly Skilled) , 01 Umbrella man(unskilled) along with 01 Project manager (Highly Qualified Professional/expert for mission planning and overall project management)) per day are required. This requires a total 08 days of Field and Data Processing duration making a total of 27 man-days & 28 man-days input respectively for LiDAR survey & LiDAR + Photogrammetry survey as an entire team.
6. (a) For setting out curves for irrigation channels carrying discharge above 1 cumec and layout of important structures etc., preferably theodolite shall be used.
 (b) The chaining of final alignment shall be done with due precision preferably after setting out curves.
 - i) The final alignments shall invariably be marked on village maps.
 - ii) The survey party for double levelling shall be headed by the A.E.
 7. For total station, it shall be mandatory to obtain a soft copy of field work raw data from the survey agency so that the results can be checked at any time.
 8. For execution of item no. 1.16, one Sub Engineer unit may engage a maximum of one Amin (Qualified) or Survey Attendant (ITI certificate holder), one field Assistant, Abhiyana (Matric) or Time-keeper (Matric). Item no. 1.16 shall be executed on prior written sanction

of the Superintending Engineer/ Chief Engineer, specifying the number of Sub-Engineer units in each Sub Division and the period for which they are to be engaged.

9. Items related to RTDAS/ SCADA system shall be used for estimation purpose only.
10. Chainage-cum-boundary stone as per type design 4 of Water Resources Department are to be provided on irrigation channels and as boundary stones for demarking, boundaries of head works, bund line and quarries etc.
11. For Item no.1.116 to 1.119, the technology to be chosen for specific projects depends on the following factors:

TECHNOLOGY	USAGE
LiDAR (Light Detection and Ranging)	<ul style="list-style-type: none"> • Uses laser pulses to measure distance to the Earth's surface. • Captures direct distance measurements, generating precise 3D point clouds. • Active remote sensing technology (provides its own light source). • Can be used where user needs High accuracy and precision, works in low light, penetrates vegetation • Can generate very high-resolution DEMs (Digital Elevation Model), DTMs (Digital Terrain Model), and 3D models than Photogrammetry survey. • Can penetrate through vegetation and light fog or smoke.

TECHNOLOGY	USAGE
Photogrammetry	<ul style="list-style-type: none"> • Uses overlapping photographs taken from different angles to create 3D models. • Relies on algorithms to process 2D images into 3D data. • Passive remote sensing technology (depends on natural or artificial light). • Detailed visual documentation and projects where high- resolution imagery is crucial, and the environment is suitable. • Good Light condition in the area is required. • Effective in area with low vegetation and during command area survey when no crop is sown in the field.

S.NO.	ABBREVIATION	FULL FORM
1	ADCP	Acoustic Doppler Current Profiler
2	ARG	Automatic Rain Gauge
3	AWS	Automatic Weather Sensor
4	BM	Bench Mark
5	CAD	Computer Added Design
6	CORS	Continuously Operating Reference Station
7	CWC	Central Water Commission
8	DCP	Distributed Co-Simulation Protocol
9	DEM	Digital Elevation Model
10	DGCA	Directorate General of Civil Aviation
11	DGPS	Differential Global Positioning System
12	DOT	Department Of Telecommunication
13	DT LEVELLING	Digital Theodolite Levelling
14	GCP	Ground Control Point
15	GIS	Geographic Information System
16	GNSS	Global Navigation Satellite System
17	GPRS	Ground Penetrating Radar Survey
18	GSD	Ground Sample Distance
19	GSM	Global System for Mobile Communication
20	GTS	Great Trigonometrical Survey
21	IIT	Indian Institute of Technology
22	INSAT	Indian National Satellite System
23	IP	Internet Protocol
24	KML	Keyhole Markup Language
25	KVA	Kilo Volt Ampere
26	LED	Light Emitting Diode
27	NEMA 4 X	National Electrical Manufacturers Association
28	PPK	Post Processed Kinematic
29	RADAR	Radio Detection and Ranging
30	RINEX	Receiver Independent Exchange Format
31	RTDAS	Real Time Data Acquisition System
32	RTK	Real-Time Kinematic
33	SCADA	Supervisory Control and Data Acquisition
34	SDC	State Data Centre
35	SOI	Survey Of India.
36	TBM	Temporary Bench Mark
37	UAV	Unmanned Aerial Vehicle
38	UIN NO.	Unique Identification Number
39	UPS	Uninterruptible Power Supply
40	UTM	Universal Transverse Mercator

41	VSAT	Very Small Aperture Terminal
42	WGS	World Geodetic System

12. **The following Indian Standards may be referred to:**

IS No.	Title
273-1990	Picks and beaters (Third revision) reaffirmed 2006
1492-1970	Metric surveying chains (first revision) (with 2 amendments) (Reaffirmed 1998)
1759-1986	Powrahs (Second revision) reaffirmed 2002
1779-1961	4-Metre levelling staff, folding type (reaffirmed 2006)
1842-1961	Surveying chain pins (arrows) (reaffirmed 2006)
1955-1961	Prismatic compass, liquid (Reaffirmed 2006)
1957-1961	Prismatic compass, non-liquid (reaffirmed-2006)
2288-1963	Ranging rods (reaffirmed 2006)
2976-1964	Optical theodolite (reaffirmed 2000)
2988-1995	Venire theodolite (with 3 amendments) (reaffirmed 2007)
4080-1994	Specification for Vertical staff gauges. (reaffirmed 2000)
4453-2009	Subsurface Exploration by pits, trenches, drift and shafts. (reaffirmed 2012)
4590-1980	Secondary level (First revision) (reaffirmed 2006)
5497-1983	Guide for topographical surveys for river valley projects. (reaffirmed 2005)
5510-1969	Guide for soil survey for river valley projects (reaffirmed 2005)
5529(1)-2013	In situ permeability tests: part 1 Tests in overburden
5542-2003	Guide for storm analysis
7784(1)-1993	Design of cross drainage works (reaffirmed 2012)
8330-2004	Telescopic tripod for surveying instruments.
9110-1979	Specification for hand operated augers
9613-1980	Specification for Primary level (reaffirmed 2006)
10442-1980	Specification for earth augers (spiral type) (reaffirmed 2006)

Survey Instruments -

- (1) Chain & compass survey
- (2) Levelling instruments
- (3) Total station survey
- (4) Drone survey
- (5) LiDAR survey
- (6) Theodolite

CHAPTER 1

SURVEY AND INVESTIGATION

Schedule of Rates

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
1.01	Dag-belling in all types of soil			
1.01.1	Single spade stroke (minimum 75 mm deep)	M	10.00	
1.01.2	Double spade "V" shaped stroke (100 mm deep)	M	14.00	
1.02	Excavation for trial pit or trial trench or other investigation work including dressing including geotagging of above, all lead and lifts etc., complete.			
1.02.1	In all kind of soil Soft/ loose/ hard/ dense soils, moorum & moorum mixed with boulders and mud.	Cum	192.00	
1.02.2	In Soft/ disintegrated/ weathered rock.	Cum	446.00	
1.02.3	In hard rock.	Cum	1416.00	
1.03	Extra rate for excavation for trial pit or trial trench or other investigation work including dressing. When depth is more than 1.5 times the specified top width including geotagging of above, all lead and lifts etc., complete.			
1.03.1	In all kind of soil Soft/ loose/ hard/ dense soils, moorum & moorum mixed with boulders and mud.	Cum	20.00	
1.03.2	In Soft/ disintegrated/ weathered rock.	Cum	45.00	
1.03.3	In hard rock.	Cum	142.00	
1.04	Extra rate for wet excavation for trial pit or trial trench or other investigation work including dressing. Below sub-soil water level including geotagging of above, all lead and lifts etc., complete.			
1.04.1	In all kind of soil Soft/ loose/ hard/ dense soils, moorum & moorum mixed with boulders and mud.	Cum	16.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
	1.04.2	In Soft/ disintegrated/ weathered rock.	Cum	36.00	
	1.04.3	In hard rock.	Cum	114.00	
1.05		Boring holes with auger in all types of soil up to 5 m depth below ground level including collecting samples including geotagging of above, all lead and lifts etc., complete.			
	1.05.1	For 200 mm dia.	M	597.00	
	1.05.2	For 250 mm dia.	M	781.00	
	1.05.3	For 300 mm dia.	M	919.00	
1.06		Chain and compass survey including geotagging of work and submission of field book and plotting			
	1.06.1	For headworks	Km	2021.00	
	1.06.2	For canal works	Km	1348.00	
1.07		Theodolite work involving fixing of stones at every tenth chain, tangent, apex or vertex points of final alignment including geotagging of above, and submission of level books, field book and plotting and all lead and lifts etc., complete.	Km	4041.00	
1.08		Fly levelling for fixing temporary bench marks including geotagging of above, and submission of level books, field book and plotting and all lead and lifts etc., complete.	Km	959.00	
1.09		Levelling for head works including geotagging of above, and submission of level books, field book and plotting and all lead and lifts etc., complete.			
	1.09.1	Below 15 m interval for basin survey and dam seat survey.	Km	2204.00	
	1.09.2	Above 15 m interval for basin survey and dam seat survey.	Km	1654.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.10		Levelling for canal works including geotagging of above and submission of level book and plotting and all lead and lifts etc., complete.			
	1.10.1	Below 15 m interval for command survey and canal survey, including survey for C.D. work	Km	1764.00	
	1.10.2	Above 15 m interval for command survey and canal survey, including survey for C.D. work.	Km	1176.00	
1.11		Double fly levelling for transfer of bench marks including geotagging of above, and submission of level books, field book and plotting and all lead and lifts etc., complete.	Km	4408.00	
1.12		Providing and fixing of standard bench marks, as per type design 8 of Water Resources Dept. including fixing of MS plate size 12x12x0.60 cm and 2 Nos. anchor bolts of 10 mm dia. And 30 cm length including shaping and welding etc., including cost of cement, metal and sand (for 0.13 Cum M-15 Design mix concrete with 20 mm graded metal) including labour for excavation in all type of strata, mixing, laying and curing of concrete including form work and fixing of MS plate including cost of water for mixing and curing of concrete including geotagging of above, all lead and lifts etc., complete.	Each	2093.00	
1.13		White washing and figuring of bench marks as per type design 7 (Annexure XII) of Water Resources Department including cost of material including geotagging of above, all lead and lifts etc., complete.	Each	262.00	
1.14		Providing and fixing benchmark as per type design 6 (Annexure XI) of Water Resources Department including embedding of 45 cm depth with 15 cm concrete all around and in bottom, with cost of cement, metal and sand (for 0.11 Cum M-15 Design mix concrete with 20 mm graded metal) including labour for excavation in all type of soil, handling and fixing of benchmark, including mixing, laying & curing of concrete with cost of water for mixing and curing of concrete including geotagging of above, all lead and lifts etc., complete.			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
	1.14.1	With chisel dressed cut stone of size 15x15x75cm.	Each	951.00	
	1.14.2	With M 15 Design mix RCC including cost of steel.	Each	902.00	
1.15	1.15.1	Providing chainage Cum boundary, stone (as per type design No.4 of WRD) including geotagging of chainage Cum boundary, all lead and lifts etc., complete.	Each	183.00	
	1.15.2	Fixing chainage Cum boundary stone, as per type design No.4 of WRD in M15 cement concrete with 40 mm graded aggregate including excavation (any strata), handling and fixing of stone, curing including geotagging of above, all lead and lifts etc., complete.	Each	722.00	
	1.15.3	Painting chainage Cum boundary stone as per (Type design No. 4 of WRD) with enamel paint and figuring and labelling with black paint including cost of paint brushes including geotagging of above, all lead and lifts etc., complete.	Each	69.00	
1.16		Labour only for survey for all types of building/ houses/ wells including taking detailed measurements thereof, measuring components like fencing etc., and entering in register, sketching, if required, noting specifications for foundation, plinth, superstructure, roofing, flooring, doors and windows etc., directly at site.	per day	1378.00	
1.17		Drilling approximately 75 mm dia. holes by calyx or any other rotary process (except dia.mond drilling) through over burden providing black steel or suitable casing pipe, using casing shoe bit, vertical or inclined up to 10 degrees to vertical as directed including cost of all materials, machinery, labour, water charges, reaming, collection of wash samples at suitable intervals, logging and labelling, supplying wooden core box, fixing casing pipes including geotagging of above, all lead and lifts etc., complete.			
	1.17.1	For depth up to 30m from surface	M	2505.00	
	1.17.2	For depth beyond 30 m from surface.	M	2756.00	
1.18		Drilling by diamond drilling, holes of minimum 75 mm			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		dia. vertical or at specified inclination using dia. mond core drilling bit, double barrel tube in masonry, concrete or rock including cost of all materials, machinery, labour, water, collection of core samples, logging & labelling samples, supplying wooden core box and re- drilling in case of collapse of sides including geotagging of above, all lead and lifts etc., complete.			
	1.18.1	For depth up to 30 m from surface.			
	1.18.1.1	0° to 10° vertically downwards	M	7537.00	
	1.18.1.2	Exceeding 10° but not exceeding 45° vertically Downwards	M	8291.00	
	1.18.1.3	0° to 45° vertically upwards	M	10552.00	
	1.18.1.4	Up to but not including 45° to the horizontal (downward)	M	8668.00	
	1.18.1.5	Up to but not including 45° to the horizontal (upward)	M	9045.00	
	1.18.2	For depth beyond 30 m from surface			
	1.18.2.1	0° to 10° vertically downwards	M	9045.00	
	1.18.2.2	Exceeding 10° but not exceeding 45° vertically Downwards	M	9950.00	
	1.18.2.3	0° to 45° vertically upwards	M	12663.00	
	1.18.2.4	Up to but not including 45° to the horizontal (downward)	M	10402.00	
	1.18.2.5	Up to but not including 45° to the horizontal (upward)	M	10854.00	
1.19		Total station survey			
	1.19.1	Topographic and cadastral survey for headworks of irrigation projects by using Total station GPS, etc., with minimum 30 number of point reading per ha, to generate 15mx15m grid and 0.5 m interval contours including transfer of entire data to computer system	Ha	733.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		in different geo-referenced layers/ themes using features of standard software, compatible with design software packages, including supply of soft and hard copies of point readings, including digitizing village maps and super imposing the contours on village map (scale 1in 4000) including marking all permanent features like roads, cart tracks, existing canals, temples, tanks, forest boundary and electric poles, etc., including marking of ridges and valleys on survey sheet including supply of 10 soft copies and 10 hard copies before and after approval of competent authority, preparation & submission of grid and L-section nalla including geotagging of above, all lead and lifts etc., complete.			
	1.19.2	Topographic and cadastral survey for command area including canal alignment works / pipe line distribution network of irrigation projects by using Total station ., with minimum 20 number of point reading Per ha, to generate 30mx30m grid and 0.5 m interval contours including transfer of entire data to computer system in different geo-referenced layers/ themes using features of standard software, compatible with design software packages, including supply of soft and hard copies of point readings, including digitizing village maps and super imposing the contours on village map (scale 1in 4000) including marking all permanent features like roads, cart tracks, existing canals, temples, tanks, forest boundary and electric poles, etc., including marking of ridges and valleys on survey sheet including supply of 10 soft copies and 10 hard copies before and after approval of competent authority, preparation & submission of 10m x10m grid for all structures of canal including geotagging of above, all lead and lifts etc., complete.	Ha	559.00	
1.20		Data interpretation of Satellite Remote Sensing Data/ imaginaries procured from Indian Remote Sensing Satellite IRS-LISS III, Resource sesat-II Cartosat-I from National Remote Sensing Centre/ ISRO for creating layers for mapping of different uses, for one toposheet (1:50,000) and one layer excluding cost of imaginaries including geotagging of above, all lead and lifts etc., complete.	Each	5536.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.21		Digitization of features, such as road, canal, water bodies, monuments, river/ nalla, boundaries, landmarks etc., complete of one toposheet (1:50,000) and including geotagging of above, all lead and lifts etc., complete.	Each	2285.00	
1.22		Geo-rectification of carto-sat data of one toposheet (1:50,000) using appropriate software.	Each	2296.00	
		Flax printing with pasting including framing in MS square pipe			
	1.23.1	Star flax printing	Sqm	600.00	
	1.23.2	Flax designing	Sqm	600.00	
	1.23.3	Iron angle framing and pasting	Sqm	700.00	
1.24		Geological Investigation			
		Labour only for systematic geological investigation for ground water survey purpose including carrying instrument at site breaking and collection of rock sample etc., complete.	Sqkm	369	
1.25		Well Inventory			
		Labour only for monitoring of water level of POW/ Piezometer.	per well	99.00	
1.26		Interference study			
	1.26.1	Labour only for interference study of wells complete for ground water survey purpose only.	job	1825.00	
	1.26.2	Labour only for collection of water samples for chemical analysis for well in 10 Sqkm area, per day 2 No. samples	Per sample	265.00	
1.27		Pumping test of well departmentally with 5 HP pumps, only for ground water draw down observation including geotagging of above and cost of P.O.L i.e. diesel, oil, Lubricants and cost of labour crew charges and all material etc., complete.	hour	294.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.28		Resistivity Survey			
	1.28.1	Resistivity Survey for selection of site for Dug well/ Tube well/ Dug Cum borewell for one site three soundings including all required material, equipment, labour and transportation of all materials including geotagging of above, all lead and lifts etc., complete.	Per site	3944.00	
	1.28.2	Labour only for resistivity survey work for selection of site for Dug well/ Tube well/ Dug Cum bore well for one site three soundings.	Per site	1982.00	
1.29	1.29.1	Geophysical & Hydrological investigation by geotechnical expert of, on and around dam up to 20 m below ground level to ascertain the cause and path of percolation (streaming potential) by non-destructive method like, Electrical imaging or Vertical electrical sounding or seismic refraction or Refraction micro tremor (ReMi) Streaming potential etc., by any one, or any combination methods including processing of data by computer software including submission of detailed report showing methodology in brief, procedure analysis & conclusion. The rates are inclusive of lead of all man, material & machines up to the site and back including geotagging of above, all lead and lifts etc., complete.	M	1202.00	
	1.29.2	Suggesting method of treatment based on conclusion of report as per item No. 1.29 (1) by Geotechnical expert	Each job	65785.00	
1.30		Hydrological Investigation			
		Fabrication and Providing, Installation of reinforcement cement concrete gauge posts of size 15 cm x 10 cm (one side tapered in 5 cm length) made with M15 concrete mix (with aggregate 20 mm graded size) - 1.80 m long. At river banks including cost of civil works in foundation embedded in M15 Reinforced cement concrete pedestal block of size 60 cm x 60 cm x60 cm including of steel reinforcement, cantering, shuttering, finishing, reinforcement over the M 15 (with aggregate 40 mm graded metal) cement concrete base of size 80 cm x 80 cm x 15 cm with 12 mm thick plastering complete and marking the	Each	5652.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		gauge with synthetic enamel with standard metric gradation of 5 mm thickness in black & white alternately & red synthetic enamel of 5 mm of width at every 100 mm including geotagging of above, all lead and lifts etc., complete.			
1.31		Providing, fixing and Providing, Installation of bank operated cableway system for discharge observation with current meter with sinker weight maximum up to 125 kg including double drum hydro-metric winch machine with manual operation suitable for horizontal and vertical movements of current meter and with the arrangement to operate silt sampler complete with automatic load break system and slip ring system including the cost of civil works, pre- fabricated pole size 2.25m long for machine side fitted with triple pulley block, and on the other side fitted with single pulley block, instruments carriage, foundation bolts with nut and washers, master plate and other fixing bolts, nuts, D shackles, U-clamps, anchor bolt, track cable, towing cable, conduction cable {co axial) with snap hooks thimble including geotagging of above, all lead and lifts etc., complete.			
	1.31.1	Up to 100 m span	Each	165899.00	
	1.31.2	From 101 to 150 m span	Each	226980.00	
	1.31.3	From 151 to 200 m span	Each	252980.00	
1.32		Providing, fixing and Installation of bank operated cable way system with cradle of capacity 1000 kg weight to take the discharge observation by using current meter sensor with sinker weight max up to 125 kg including double drum hydro-metric winch machine with manual operation suitable for horizontal and vertical movements of current meter and with the arrangement to operate silt sampler complete with automatic load break system, slip ring system including all civil works, prefabricated pole size 2.25 m long for machine side fitted with triple pulley block, prefabricated pole size 2.25 m long on the other side fitted with single pulley block, instruments carriage, foundation bolts with nut and washers, master plate and other fixing bolts nuts, D shackles, U -clamps,			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		anchor bolt, track cable, towing cable, conduction cable (co axial) with snap hooks thimble including geotagging of above, all lead and lifts etc., complete.			
	1.32.1	Up to 100 m span	Each	229654.00	
	1.32.2	From 101 to 150 m span	Each	311256.00	
	1.32.3	From 151 to 200 m span	Each	366987.00	
1.33		Providing and fixing of 25 mm diameter steel guide ropes across the river for discharge observation including geotagging of above, all lead and lifts etc., complete.	M	1420.00	
1.34		Painting of gauge post 1.8 m long with synthetic enamel of approved brand & manufacture to give an even shade by two or more coats and marking the gauge with Japan paint Red, Black and White with standard metric gradation marking of 5 mm thickness in black & white alternately & red synthetic enamel of width 5 mm at every 50 mm including geotagging of above, all lead and lifts etc., complete.	Each	1250.00	
1.35		Supply, Providing, Installation, testing and commissioning of automatic Rainfall station with GSM/ GPRS Telemetry communication system including geotagging of above, all lead and lifts etc., complete.			
	1.35.1	Providing, Installation testing & Commissioning of automatic rainfall station (tipping bucket type) complete with all accessories including supply of real time (GSM/ GPRS) Telemetry data communication system with data logger, display unit with all equipment and accessories such as solar power supply system including solar panel, charge regulator, battery and station grounding system, GSM/ GPRS modem, System enclosure with gasketing and maintenance free rechargeable batteries as per technical specification including geotagging of above, all lead and lifts etc., complete.	Each	250550.00	
	1.35.2	Cost of related services for Providing, Installation and commissioning of entire RTDAS training for operation	Each	140000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		and maintenance, site preparation and civil works, integration of RTDAS and backup acquisition system with SMS, provision of manuals, documents and reports, inspection and testing and initial maintenance up to final acceptance of the entire system as per technical specifications including geotagging of above, all lead and lifts etc., complete.			
1.36		Supply, Providing, Installation, testing and commissioning of automatic water level Radar sensor with GSM/ GPRS telemetry communication system including geotagging of above, all lead and lifts etc., complete.			
	1.36.1	Providing, Installation testing & Commissioning of Automatic Water level radar sensor complete with all accessories including supply of real time (GSM/ GPRS) Telemetry data communication system with data logger, display unit with all equipment and accessories such as, solar power supply system including solar panel, charge regulator, battery and station grounding system, GSM/ GPRS modem, system enclosure with gasketing and maintenance free rechargeable batteries as per technical specification including geotagging of above, all lead and lifts etc., complete.	Each	345698.00	
	1.36.2	Cost of related services for Providing, Installation and commissioning of entire RTDAS training for operation and maintenance, site preparation and civil works, integration of RTDAS and backup acquisition system with SMS, provision of manuals, documents and reports, inspection and testing and initial maintenance up to final acceptance of the entire system as per technical specifications including geotagging of above, all lead and lifts etc., complete.	Each	145000.00	
1.37		Supply, Providing, Installation, testing and commissioning of automatic weather station with GSM/ GPRS telemetry communication system including geotagging of above, all lead and lifts etc., complete.			
	1.37.1	Providing, Installation testing & Commissioning of automatic Weather station complete with all	Each	645982.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		accessories including supply of real time (GSM/ GPRS) Telemetry data communication system with data logger, display unit with all equipment and accessories such as solar power supply system including solar panel, charge regulator, battery and station grounding system, GSM/ GPRS modem, system enclosure with gasketing and maintenance free rechargeable batteries as per technical specification including geotagging of above, all lead and lifts etc., complete.			
	1.37.2	Cost of related services for Providing, Installation and commissioning of entire RTDAS, training for operation and maintenance, site preparation and civil works, integration of RTDAS and backup acquisition system with SMS, provision of manuals, documents and reports, inspection and testing and initial maintenance up to final acceptance of the entire system as per technical specifications including geotagging of above, all lead and lifts etc., complete.	Each	270000.00	
1.38		Supply, Providing, Installation, testing and commissioning of automated Gate Sensor with GSM/ GPRS telemetry communication system including geotagging of above, all lead and lifts etc., complete.			
	1.38.1	Providing, Installation testing & Commissioning of automated Gate sensor complete with all accessories including supply of real time (GSM/ GPRS) Telemetry data communication system with data logger, display unit with all equipment and accessories such as solar power supply system including solar panel, charge regulator, battery and station grounding system, GSM/ GPRS modem, System enclosure with gasketing and maintenance free rechargeable batteries as per technical specification including geotagging of above, all lead and lifts etc., complete.	Each	585000.00	
	1.38.2	Cost of related services for Providing, Installation and commissioning of entire RTDAS training for operation and maintenance site preparation and civil works, integration of RTDAS and backup acquisition system with SMS, provision of manuals, documents and reports, inspection and testing and initial maintenance up to final acceptance of the entire	Each	195000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		system as per technical specifications including geotagging of above, all lead and lifts etc., complete.			
1.39		Establishment of Data Centre			
		Establishment of Data Centre with earth receiving station and GSM/ GPRS ground station including quality control function, design, manufacture, testing, delivery along with the server and software solution, associated interface wiring, termination, commissioning, site acceptance testing and supply of mandatory spares etc., as per technical specifications including geotagging of above, all lead and lifts etc., complete.	Set	725689.00	
1.40		Providing, Installation testing & Commissioning of ancillary equipment's to the data centre such as one laser colour printer, one black & white laser printer, modems and routers, backup resources along with one display system (42" LED) at the office of Chief Engineer and one display system (42" LED) at Data Centre including work stations including geotagging of above, all lead and lifts etc., complete.	Set	168000.00	
1.41	1.41.1	Socio economic survey for preparation of social impact assessment study of proposed irrigation Project	Per family	498.00	
	1.41.2	Monitoring and evaluation of post status of project effected families after completion of the project.	Per family	498.00	
1.42		Environment impact assessment management plan including required data collection, necessary studies for environmental impact assessment, preparation of resettlement and rehabilitation plan, dam break analysis etc., submission of draft environmental impact assessment/ environment management plan with executive summary in Hindi and English to State Pollution Control Board including supply of 10 soft copies and 10 hard copies for conducting public hearing (only for major project), preparation of final environmental impact assessment/ environment management plan including public hearing report as per proposed TOR(Terms of Reference) and submission to expert appraisal committee/ state			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		expert appraisal committee and obtaining environment clearance from competent authority including preparation and submission of six monthly monitoring report to regional office, ministry of forest and climate change and other compliances in accordance with condition stipulated in environment clearance.			
	1.42.1	For CCA above 10000 ha. (Estimation to be done for bifurcated rates. for example, for CCA 15000 ha. (10000 X 284 + 5000 X 160)	Per ha of CCA	60.00	
	1.42.2	For CCA below 10000 ha.	Per ha of CCA	200.00	
1.43		Survey for determining environmental impact on the submergence area and adjoining area, command area of a newly constructed or old reservoirs including geotagging of above, all lead and lifts etc., complete.	Per ha of CCA	30.00	
1.44		Construction of Brick Pedestal Sign board 1.2 m wide and 1.8 m. height above ground level in brick masonry with CM 1:6, 20 mm thick plaster with CM 1:4, 10 cm thick coping in C.C. M-15 20 mm graded metal, abound border of 2cm. Strip in black colour, white back ground painting, lettering and figuring complete as per drawing Annexure-XV including geotagging of above, all lead and lifts etc., complete.	Each	7100.00	
1.45		Providing, Installation testing & Commissioning of Automated Rain Gauge Station (ARG) Equipment set with necessary hardware as per technical specification including geotagging of above, all lead and lifts etc., complete.	No.	61582.00	
1.46		Providing, Installation testing & Commissioning of Automated Water Level Recorder (non-contact - RADAR) for River/ Canals/ Reservoirs having 15m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	129888.00	
1.47		Automated Water Level Recorder (non-contact RADAR) for River/ Canals/ Reservoirs having 20m range with all necessary hardware as per technical	No.	149888.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		specifications including geotagging of above, all lead and lifts etc., complete.			
1.48		Providing, Installation testing & Commissioning of Automated Water Level Recorder (non-contact - RADAR) for River/ Canals/ Reservoirs having 35m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	219444.00	
1.49		Providing, Installation testing & Commissioning of Automated Water Level Recorder (non-contact - RADAR) for River/ Canals/ Reservoirs having 70m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	25144.00	
1.50		Providing, Installation testing & Commissioning of Automated Water Level Recorder (Shaft Encoder sensor) for Reservoirs having 50m range with all necessary hardware as per technical specification including geotagging of above, all lead and lifts etc., complete.	No.	199900.00	
1.51		Providing, Installation testing & Commissioning of Automated Water Level recorder (Submersible pressure Transducer) for Reservoirs having 0-30m range with all necessary hardware as per technical specification including geotagging of above, all lead and lifts etc., complete.	No.	135000.00	
1.52		Providing, Installation testing & Commissioning of Automated Water Level Recorder (Ultrasonic Sensor) for Reservoirs having 0- 10m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	91365.00	
1.53		Providing, Installation testing & Commissioning of Shaft Encoder based rotary position sensor with Digital Display Type Gate Position Sensors for indication and monitoring of Spillway gates, intake Gates. Silt flushing gates including cabling & integration with data logger as per technical specification including geotagging of above, all lead and lifts etc., complete.	No.	91365.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.54		Providing, Installation testing & Commissioning of Air Temperature & Relative Humidity sensor, cable with radiation shield, Equipment set with necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	60258.00	
1.55		Providing, Installation testing & Commissioning of Wind speed & wind direction sensor and cable set with necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	122000.00	
1.56		Providing, Installation testing & Commissioning of Atmospheric Pressure sensor and cable set with necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	96480.00	
1.57		Providing, Installation testing & Commissioning of Solar Radiation sensor and cable set with necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	73500.00	
1.58		Providing, Installation testing & Commissioning of Automated Pan evaporimeter equipment set with necessary hardware as per technical specifications which is to be integrated with Automatic Weather Station (AWS) including geotagging of above, all lead and lifts etc., complete.	No.	186000.00	
1.59		Providing, Installation testing & Commissioning of Data Logger 2 analogue channels type with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	262000.00	
1.60		Providing, Installation testing & Commissioning of Data Logger 2 analogue channels type with GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	156888.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.61		Providing, Installation testing & Commissioning of Data Logger 8 analogue channels type with INSAT GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	310255.00	
1.62		Providing, Installation testing & Commissioning of Data Logger 8 analogue channels type with GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	225222.00	
1.63		Providing, Installation testing & Commissioning of Solar panel, charger regulator, batteries, lightening arrestor with connectors, NUMEX box to suit master unit with locking, cables and conduit for cables, mast to mount DCP as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	115000.00	
1.64		Supply of Acoustic Doppler current profiler (ADCP) with bottom tracking facilities, associated peripherals, Laptop along with software and with all accessories for discharge measurement of rivers, at attachments at site. complete as per technical specifications and providing, Installation testing & commissioning of RTDAS including geotagging of above, all lead and lifts etc., complete.	No.	3450000.00	
1.65		Providing, Installation testing & Commissioning of Data Logger with 2 AI sensor input type, with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	
1.66		Providing, Installation testing & commissioning of Data Logger with 2 AI sensor input type with GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.67		Providing, Installation testing & commissioning of Data Logger with 8AI sensor input type with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	
1.68		Providing, Installation testing & commissioning of Data Logger with 8AL sensor input type with GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	
1.69		Providing, Installation testing & commissioning of Solar panel, charger regulator, batteries, lightening arrestor with all connectors, NEMA4X box to suit master unit with locking, cables and conduit for cables, associated civil works for mast to mount DCP. as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	28500.00	
1.70		Providing, Installation of Chain link fencing of (5m x 5 m x 2m) along with lockable gates for external protection of Sensors and DCP at RTDAS as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	82450.00	
1.71		Providing, Installation Chain link fencing of 10m x 10m x 2m along with lockable gates for external protection of Sensors and DCP at RTDAS as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	139000.00	
1.72		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River/ Canal/ Reservoirs and associated civil works for mounting the Radar having 15m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	10500.00	
1.73		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River/ Canal/ Reservoirs and associated	No.	14000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		civil works for mounting the Radar having 20m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.			
1.74		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River/ Canal/ Reservoirs and associated civil works for mounting the Radar having 35m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15000.00	
1.75		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River/ Canal/ Reservoirs and associated civil works for mounting the Radar having 70m range with all necessary hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	
1.76		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (Shaft Encoder Sensor) for Reservoirs have 50m range with all necessary hardware and associated civil work as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15450.00	
1.77		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (Submersible Pressure Transducer) for Reservoirs having 0-30m range with all necessary mounting & Providing, Installation hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15000.00	
1.78		Providing, Installation Testing & Commissioning of Automated Water Level Recorder (Ultrasonic sensor) for Reservoirs having 0-10m range with all necessary hardware and associated civil work as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	15000.00	
1.79		Providing, Installation Testing & Commissioning of Automated Spillway Gate Sensor on various gates	No.	12500.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		including cabling conduit which has to be integrated with Data logger as per technical specifications including geotagging of above, all lead and lifts etc., complete.			
1.80		Providing, Installation Testing & Commissioning of Air temperature & Relative Humidity sensor with radiation shield. Wind speeds & wind director sensor Atmospheric Pressure sensor, Solar Radiation sensor, Equipment set necessary cable and mounting hardware as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	12500.00	
1.81		Providing, Installation Testing & Commissioning of Automated pan evaporimeter Equipment set necessary hardware as per technical specifications which is to be integrated with Automated weather stations (AWS) including geotagging of above, all lead and lifts etc., complete.	No.	12500.00	
1.82		Providing, Installation Testing & Commissioning of Acoustic Doppler Current Profiler (ADCP) with bottom tracking facilities associated peripherals Laptop along with software and with all accessories for discharge measurement of rivers attachments at site complete as per the technical specification with two years warranty period. O&M Comprehensive Warranty and AMC Charge including geotagging of above, all lead and lifts etc., complete.	No.	55000.00	
1.83		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Rain Gauge (ARG) Station with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement of material & consumable as & when required at bidder cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	185000.00	
1.84		Comprehensive AMC for 2 years complete Automatic Rain Gauge (ARG) Station system as per schedule of	No.	135000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		Rate with telemetry along with all accessories installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.			
1.85		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Radar type (15m) with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement for material & consumable as & when required at bidder cost, the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	195677.00	
1.86		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Radar type (15 m) system as per schedule of Rate with telemetry along with all accessories installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	164751.00	
1.87		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Radar type (20m) with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement of material & consumable as & when required at bidder cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	226760.00	
1.88		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Radar type (20 m) system as per schedule of Rate with telemetry along	No.	165000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		with all accessories installed at designated locations under this contract after 5-year warrantee period This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.			
1.89		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Radar type (35m) with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement of material & consumable as & when required at bidder cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	242111.00	
1.90		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Radar type (35 m) system as per schedule of Rate with telemetry along with all accessories installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	198000.00	
1.91		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Radar type (70m) with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement of material & consumable as & when required at bidder cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	252000.00	
1.92		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Radar type (70 m) system as per schedule of Rate with telemetry along with all accessories installed at designated locations	No.	216500.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.			
1.93		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Shaft Encoder Type with Telemetry along with accessories installed at designated locations under this contract after final acceptance of RTDAS systems. This includes replacement of material & consumable as & when required at bidder cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	235000.00	
1.94		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Shaft Encoder Type system as per schedule of Rates with telemetry along with all accessories installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	198000.00	
1.95		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Submersible Pressure Transducer with Telemetry along with accessories installed at designated location under this contract after final acceptance of RTDAS system. This includes replacement of material & consumable as and when required at bidder cost. The cost of communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmissions shall be borne by purchaser.	No.	174000.00	
1.96		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Submersible Pressure Transducer System as per schedule of Rates with	No.	135000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		telemetry along with all accessories installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.			
1.97		Five Years Operation & Maintenance and comprehensive Warranty for Automatic Water Level Recorder (AWLR) Ultrasonic sensors with Telemetry along with accessories, installed at designated locations under this contract after final acceptance of RTDAS system. This includes replacement of material & consumables as and when required at bidder cost. The cost of communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	195983.00	
1.98		Comprehensive AMC for 2 years complete Automatic Water Level Recorder (AWLR) Ultrasonic sensor system as per schedule of Rates with telemetry along with all accessories, installed at designated locations under this contract after 5-year warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	159550.00	
1.99		Five Years Operation & Maintenance and comprehensive Warranty for Gate sensors with Telemetry along with accessories, installed at designated locations under this contract after final acceptance of RTDAS system. This includes replacement of material & consumable as & when required at bidder cost. The cost of commutations for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	198000.00	
1.100		Comprehensive AMC for 2 years complete Gate sensor system as per schedule of Rates with telemetry along with all accessories, installed at	No.	155682.00	

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	designated locations under this contract after 5 years warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.			
1.101	Five Years Operation & Maintenance and comprehensive Warranty for Automated Weather station (AWS) with Pan Evaporimeter with Telemetry along with accessories, installed at designated locations under this contract after final acceptance of RTDAS system. This includes replacement of material & consumable as & when required at bidder cost. The cost of commutations for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	385550.00	
1.102	Comprehensive AMC for 2 years complete Automated Weather station (AWS) with Pan Evaporimeter system as per schedule of Rates with telemetry along with all accessories installed at designated locations under this contract after 5 years warranty period. This includes the cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	298000.00	
1.103	Comprehensive AMC for 3 years for 1 ADCP along with all accessories, installed at designated locations under this contract after 2 year warranty period. This includes the replacement of batteries as and when required at bidder cost.	No.	945000.00	
	DATA CENTER EQUIPMENTS			
1.104	Server along with server rack, Monitor and 3 KVA online UPS as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	456000.00	
1.105	IT Hardware which includes required static IP, Router, Switches, firewall system and A3 Size colour printer as per technical specifications including	No.	154222.00	

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	geotagging of above, all lead and lifts etc., complete.			
1.106	Computer Node (Workstation) along with Monitor and necessary accessories as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	85000.00	
1.107	42" LED Display System as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	78000.00	
1.108	High speed synchronous internet connection (min 50 mbps upload and download) for five years including geotagging of above, all lead and lifts etc., complete.	No.	1018200.00	
1.109	VSAT facility at data centre and GSM & GPRS data receiving system with all ancillary equipment as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	459000.00	
1.110	Providing, Installation testing & commissioning of Server along with server rack, Monitor and 3 KVA online UPS, Computer node (Work Station) 42" LED Display, High speed synchronous internet connection, IT Hardware which includes required Static IP, Router, switches, firewall system and A3 size colour printer and VSAT facility at data centre and GSM & GPRS data receiving system complete as per technical specifications including geotagging of above, all lead and lifts etc., complete.	No.	55900.00	
1.111	Five Years Operation & Maintenance and comprehensive Warranty for Data Centre Equipment at State Data Centre (SDC) with IT hardware. This includes replacement of material & consumable as & when required at bidders cost. The cost of Communication for GSM/ GPRS VSAT for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser. Minimum one Service Engineer shall be placed at State Data Centre for Operation of RTDAS system with telemetry for entire warranty period 5 years.	No.	2698550.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.112		Comprehensive AMC for 2 years complete Data Centre Equipment at State Data Centre (SDC) system as per schedule of Rates with telemetry along with all accessories installed at State Data Centre under this contract after 5 years warranty period. This includes the cost of Communication for GSM & GPRS, VSAT telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	No.	1112100.00	
1.113		3 Day Training of the purchaser's personnel (15 numbers) at the supplier's plant/ and/ or/ onsite in assembly, start-up, operation, maintenance and/ or repair of the supplied goods. Course topics will include sensor calibration, data logger configuration, data downloading, data retrieval, collection, trouble shooting, processing maintenance requirements and procedures for equipment configuration, Providing, Installation, site testing and commissioning including training kit containing course material in soft and hard copies as per technical specification.	No.	105500.00	
1.114		Establishment of DGPS (Differential Global Positioning System) base stations (Primary Ground Control Points/ Primary Benchmark) in dual frequency static mode for establishment of benchmarks for topographical or UAV (Unmanned Aerial Vehicle)/ Drone survey base station by applying the methods of connecting it to Survey of India. (SOI) GTS (Global Telecommunication System) & GCPs (Ground Control Points) and applying post processing corrections to the observed data for a minimum of 3 hrs. observation by using the methods of Triangulation or level flying in static mode only including geotagging of above, all lead and lifts etc., complete.	Point	4919.00	
		Note:			
		• Prior to the DGPS survey, it is must to get the departmental approval based on the guidelines of Survey of India.			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		03 No. of DGPS Point should be observed for Triangulation out of which 2 No. of points (also known as base station) should be Survey of India. (SOI) GCP's, along with the presumption that SOI Benchmarks are located within 40 Km of distance from the required location.			
		• In the case of SOI Benchmarks located beyond 40 Km a triangle must be established at every 30 Km to transfer the levels at the required location.			
		• The Projection system shall be UTM & Vertical datum must be: MSL SOI Linked MSL (mean sea level) and Horizontal projection in WGS-84			
		• All the RAW data & RINEX file outcome with corrections shall be handed over to the Engineer in-charge.			
		• All the Bench Marks must be geo tagged using the departments geo-tagging application and shall be submitted as report with all the necessary details as per the SOI Specifications.			
		• Benchmark pillar shall be as per the Standard Benchmark Type Design 08 of Water Resource Department, the cost of which shall be added separately. All the Benchmarks shall be painted in Black & White chequered pattern with IDs marked on it with stencil cut alphanumeric. A Bombay Nails of 4 inch with a washer shall be hammered at the centre of cross hair, so that even after paint if eroded the location in the form of nail remains in the field.			
1.115		Establishment of DGPS Secondary Control Points (Temporary BM) with Level flying from nearest SOI benchmark (GCP/GTS) or Department Established Primary Benchmarks (as per Item No.1.114) to required locations/DGPS Base station for establishing TBM for topographical Survey or UAV/ Drones survey for establishing and connecting it to SOI Mean Sea Level datum to carry out the necessary survey including geotagging of above, all lead and lifts etc., complete.	Point/ Km	2188.00	

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	Note:			
	Before start of a survey, it is must to get the approval from department based on Survey of India. Guidelines for DGPS Survey.			
	• Levels should be observed at every 1 Km grid centroid of the planned GRID/TBM with at least 30 minutes of concurrent observation time using Static Mode of DGPS Observation with at least 2 DGPS instruments. All the TBMs shall be marked on the physical structures like bridges, culverts, office buildings etc., In the case of non-presence of this permanent structure, benchmark as per type 6 design of water resource department shall be used, the cost of which shall be added separately.			
	The base stations (TBM) shall be established/ connected on the previously established DGPS triangulated base stations observed using static mode and base stations shall be approved by engineer-in- charge.			
	The Projection system shall be UTM & Vertical datum must be MSL (Survey of India. SOI Linked), Horizontal: WGS-84 (UTM).			
	All the Benchmarks shall be painted in Black & White chequerred pattern with IDs marked on it with stencil cut alphanumeric. A Bombay Nails of 4 inch with a washer shall be hammered at the centre of cross hair, so that even after paint if eroded the location in the form of nail remains in the field.			
	All the TBM shall be geo tagged using the department geo-tagging application and shall be submitted as report with all the necessary details as per the SOI Specifications.			
1.116	For minimum 5000 ha: Drone based Photogrammetry survey at minimum 3.5 cm GSD with 1 m DEM/ DSM and 25 cm or better Ortho mosaic Resolution Image with minimum 80% forward and 70% side overlap for every type of mapping, having return to home capability, Flight planning &	Hact	587.00	

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	control Software, etc., complete. including geotagging of above, all lead and lifts etc., complete.			
	RTK/ PPK Enabled Survey Grade Drone based Photogrammetry survey (RGB Camera 20 MP or better with Hight Definition Capabilities & Oblique camera support/ double grid mission) for all types of irrigation projects and water bodies to generate seamless Orthomosaics of the project areas, assessment of crop land, ground elevation maps including transfer of entire data to computer system in different geo- referenced layers/ themes using features of Image processing software like Pix4d/ equivalent or better, compatible with GIS Software, including supply of 10 soft copies and 10 hard copies (RAW + Processed images) along with the Processed Report generated having results of better than 3.5 cm GSD etc., complete.			
	Note:			
	This requires prior DGPS Control Point Survey establishment as per Item No. 1.114 and 1.115			
	The height of flying UAV/ Drones shall be as per the Prevailing DGCA guidelines. Valid license certificates/invoices to be submitted. The vendor is required to submit UAV/ Drone DGCA Registration certificate (UIN) under Digital Sky Platform.			
	Vendor need to refer SOI Reference for DGPS Survey Methodology with the CORS Network referencing to verify the levels.			
	There shall be 6 (Six) or more directly measured points per sq. m in open area.			
	• In every Sqkm of GRID, 04 No.'s of DGPS GCP's spreader evenly with Ground Cross Marking shall be observed in RTK mode with reference to the Established DGPS TBMs to provide necessary correction for Drone Data Processing.			
	Drone must be PPK/ RTK Enabled to capture accurate Geo Tagged Images.			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	<ul style="list-style-type: none"> During drone flight all the time DGPS base station shall be established to maintain the PPK workflow. 			
	<ul style="list-style-type: none"> Flight must be perpendicular to the ground and Ground Control Point/ BM/ TBM should be clearly visible on Drone Images marked with black and white chequered pattern. 			
	<ul style="list-style-type: none"> Ortho image processing report shall be generated for submission to department with the deliverables. 			
	<ul style="list-style-type: none"> All the data/ Images must be on a single vertical and horizontal coordinate system. 			
	<ul style="list-style-type: none"> The Projection system shall be UTM & Vertical datum must be: SOI Linked MSL (mean sea level) and Horizontal projection in WGS-84. 			
	<ul style="list-style-type: none"> Planning and Provision of Planimetric ground control points by Multi frequency GNSS receivers in relative static positioning mode required for Drone survey in Hilly and plain terrains and DT levelling (if required). It includes field work, processing and computation. 			
	<ul style="list-style-type: none"> The outcomes shall be geotiffs, Shape Files, KML & DWG Files for DSM, DEM, Point Clouds, contours etc. not the least and as per SOI framework for Data deliverables. All the Maps shall be as per the Departmental Standards. 			
	<ul style="list-style-type: none"> All the RTK/ PPK Workflow Data shall be submitted with all the corrections applied to the images of drone 			
	<ul style="list-style-type: none"> All the data deliverables shall be compatible with ArcGIS/ QGIS/ CAD software's. 			
	<ul style="list-style-type: none"> Valid license certificates/invoices shall be submitted. 			
	<ul style="list-style-type: none"> The vendor shall submit UAV/Drone DGCA Registration certificate (UIN) under Digital Sky Platform. 			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
1.117	for minimum 5000 ha: Drone based Photogrammetry survey at minimum 2.5 cm GSD with 0.5m DEM/DSM with 15 cm or better Orthomosaics resolution Image with minimum 80% forward and 70% side overlap for every type of mapping, having return to home capability, Flight planning & control Software, etc., complete including geotagging of above, all lead and lifts etc., complete.	Hact	660.00	
	RTK/PPK Enabled Survey grade Drone based Photogrammetry survey (RGB camera 20 MP or better with high definition capabilities & oblique camera support/ double grid mission) for all types of irrigation projects and water bodies to capture Ground elevations and other topographic features like roads, canals, embankments, dams, sluice gates, spillways, trees, hills, agriculture lands dividers, buildings houses etc. & generate seamless Orthomosaics of the project areas including transfer of entire data to computer system in different geo-referenced layers/themes using features of Image processing software like Pix4d /equivalent or better, compatible with GIS software, including supply of 10 soft copies and 10 hard copies (RAW + Processed images) along with the Processed Report generated having results of better than 2.5 cm GSD etc., complete.			
	Note:			
	• This requires prior DGPS Control Point Survey establishment as per Item No.1.114. and 1.115			
	This height of the UAV/ Drones shall be as per the Prevailing DGCA guidelines.			
	Vendor need to refer SOI Reference for DGPS Survey Methodology for CORS Network referencing to verify the levels.			
	There shall be 8 (Eight) or more directly measured points per sq. m in open area.			
	• In every Sqkm of GRID, 04 No.'s of DGPS GCP's spreader evenly with Ground Cross Marking shall be			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	observed in RTK mode with reference to the Established DGPS TBMs to provide necessary correction for Drone Data Processing.			
	<ul style="list-style-type: none"> • Flight must be perpendicular to ground and ground control points/BM/TBM should be clearly visible on drone images marked with black and white chequered pattern. 			
	<ul style="list-style-type: none"> • Drone must be PPK/ RTK Enabled to capture accurate Geo Tagged Images. 			
	Orthoimage processing report shall be generated for submission to department with the deliverables.			
	<ul style="list-style-type: none"> • The projection system shall be UTM & Vertical datum must be: SOI Linked MSL (mean sea level) and Horizontal projection in WGS-84. 			
	<ul style="list-style-type: none"> • Ground control point/BM should be clearly visible on drone Images. 			
	<ul style="list-style-type: none"> • Planning and provision of planimetric ground control points by multi frequency GNSS receivers in relative static positioning mode required for drone survey in hilly and plain terrains and DT levelling (if required). It includes field work, processing and computation. 			
	<ul style="list-style-type: none"> • The outcomes shall be geotiffs, Shape Files, KML & DWG files for DSM, DEM, Point Clouds, contours etc. and as per SOI framework for Data deliverables. All the Maps shall be as per the Departmental Standards. 			
	<ul style="list-style-type: none"> • All the RTK/PPK workflow data shall be submitted with all the corrections applied to the images of drone. 			
	<ul style="list-style-type: none"> • All the data deliverables shall be compatible with ArcGIS/QGIS/CAD software's. 			
	<ul style="list-style-type: none"> • Valid license certificates/invoices shall to be submitted. 			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	•The vendor shall submit UAV/Drone DGCA Registration certificate (UIN) under Digital Sky Platform.			
1.118	for minimum 5000 ha: Drone based LiDAR survey for 25 cm DSM with Point cloud, including geotagging of above, all lead and lifts etc., complete.	Hact	792.00	
	RTK/ PPK Enabled survey grade Drone to capture elevation based LiDAR survey to capture Ground elevation details in concurrence with the DGPS for preparation of seamless Topographic maps & terrain for all types of water resources and irrigation projects to capture ground elevations and other topographic features like roads, canals, embankments, dams, sluice gates, spillways, trees, hills, agriculture lands divides, buildings houses etc. with minimum 80 % forward and 70% side overlap for every type of mapping having return to home capability, flight planning & control software, connected with DGPS base stations (using suitable UTM/WGS 84 coordinate system as per instructions from engineer -in -charge) linked to Departmental/ SOI benchmarks along with preparing points clouds to generate & deliver DEM/ DSM of the project area should be compatible with GIS Software with ground spatial resolution of 0.25 m or better to generate contours of the area for at least 0.25 m/ 0.5 m/ 1m/ 2.5m/ 5m as per the instructions of Engineer in charge and as per the specifications, including supply of 10 soft copies and 10 hard copies (Point clouds) along with the Processed Report generated having results as desired above.			
	• This requires prior DGPS Control Point Survey establishment as per UCSR Component " Establishment of DGPS Base Station" and " Establishment of TBM".			
	The height for flying the UAV/ Drones shall be as per the Prevailing DGCA guidelines. All the outputs shall be in the form of LiDAR Points clouds, DEM (and/or) DSM terrains. The controller shall be able to provide real time sample point cloud processing to see the correctness of the data being captured during the			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	field itself to make multiple revisits for minimising the errors.			
	• Vendor shall refer SOI reference for DGPS Survey methodology for CORS Network referencing to verify the levels.			
	• In every Sqkm of GRID, DGPS GCP's with Ground Cross Marking shall be observed in RTK mode with reference to the established DGPS TBMs to provide necessary correction for drone data processing.			
	• Drone must be PPK/RTK enabled to capture accurate Coordinate system with SOI datum correction.			
	• During drone flight all the time DGPS base station shall be established maintain the PPK workflow.			
	• Flight must be perpendicular to ground and ground control points/BM/TBM should be clearly visible on drone images marked with black and white chequered pattern.			
	• Ortho image processing report shall be generated for submission to department with the deliverables.			
	• During ortho-image capture flights, the weather should clear of fog, haze, dust, smoke etc., and should be under well illuminated sunlight conditions			
	• The Projection system shall be UTM & Vertical datum must be: SOI Linked MSL (mean sea level) and Horizontal projection in WGS-84.			
	• Ground Control Point/BM should be clearly visible on Drone Images.			
	• Planning and provision of planimetric ground control points by Multi frequency GNSS receivers in relative static positioning mode required for drone survey in hilly and plain terrains and DT levelling (if required). It includes field work, processing and computation.			
	• The outcomes shall be geotiffs, Shape Files, KML & DWG files for DSM, DEM, Point Clouds, contours etc.			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		and as per SOI framework for data deliverables. All the maps shall be as per the departmental standards.			
		• All the RTK/PPK workflow data shall be submitted with all the corrections applied to the images of drone			
		• All the data deliverables shall be compatible with ArcGIS/QGIS/CAD software's.			
		• Valid license certificates/invoices shall be submitted.			
		• The vendor shall require to submit UAV/ Drone DGCA Registration certificate (UIN) under Digital Sky Platform.			
1.119		For minimum 5000 ha: Drone based LiDAR + Photogrammetry survey at 2.5cm GSD & 25 cm DSM with 15 cm or better Orthomosaics image with point cloud, including geotagging of above, all lead and lifts etc., complete.	Hact	824.00	
		RTK/PPK Enabled Survey Grade Drone based LiDAR survey (Elevation only) to capture Ground Elevation details for preparation of seamless Topographic maps & terrain for all types of water resources and irrigation projects to capture Ground elevations and other topographic features like roads, canals, embankments, dams, sluice gates, spillways, trees, hills, agriculture lands dividers, buildings houses etc. with minimum 80% forward and 70% side overlap for every type of mapping, having return to home capability, Flight planning & control Software, connected with DGPS base-stations (using suitable UTM/WGS 84 coordinate system) and shall be linked to Departmental/SOI benchmarks and preparing points clouds to generate & deliver DEM (and/ or) DSM of the project area should be compatible with GIS software with ground spatial resolution of 0.25 m or better to generate contours of the area for at least 0.5 m/1m/2.5m/5m as per the instructions of Engineer-in- Charge complete.			
		Note:			

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	<ul style="list-style-type: none"> This requires prior DGPS Control Point Survey establishment as item no. 1.114 and 1.115 			
	The height for the flying the UAV/Drones shall be as per the Prevailing DGCA guidelines. All the outputs shall be in the form of LiDAR Points clouds, DEM, DSM terrains. The controller shall be able to provide real time sample point cloud processing to see the correctness of the data being captured during the field itself to make multiple revisits for minimising the errors.			
	<ul style="list-style-type: none"> Vendor shall refer SOI Reference for DGPS Survey Methodology for CORS Network referencing to verify the levels. 			
	<ul style="list-style-type: none"> In every Sqkm of GRID, DGPS GCP's with ground cross Marking shall be observed in RTK mode with reference to the established DGPS TBMs to provide necessary correction for drone data processing. 			
	<ul style="list-style-type: none"> Drone must be PPK/RTK enabled to capture accurate coordinate system with SOI datum correction. 			
	<ul style="list-style-type: none"> Flight should be perpendicular to ground and ground control points/BM/TBM should be clearly visible on drone images marked with black and white chequered pattern 			
	<ul style="list-style-type: none"> Ortho image processing report shall be generated for submission to department with the deliverables. 			
	<ul style="list-style-type: none"> During ortho-image capture flights, the weather should clear of fog, haze, dust, smoke etc., and should be under well illuminated sunlight conditions. 			
	<ul style="list-style-type: none"> The projection system shall be UTM & Vertical datum must be: SOI Linked MSL (mean sea level) and Horizontal projection in WGS-84 			
	Ground control point/BM should be clearly visible on drone images marked with black and white chequered pattern.			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		<ul style="list-style-type: none"> Planning and provision of planimetric ground control points by Multi frequency GNSS receivers in relative static positioning mode required for drone survey in hilly and plain terrains and DT levelling (if required). It includes field work, processing and computation. 			
		<ul style="list-style-type: none"> The outcomes shall be geotiffs, Shape Files, KML & DWG Files for DSM, DEM, Point Clouds, contours etc., and as per SOI framework for Data deliverables. All the maps shall be as per the departmental standards. 			
		All the RTK/PPK Workflow Data shall be submitted with all the corrections applied to the images of Drone.			
		<ul style="list-style-type: none"> All the data deliverables shall be compatible with ArcGIS/QGIS/CAD software's. 			
		Valid license certificates/invoices shall be submitted.			
		<ul style="list-style-type: none"> The vendor shall submit UAV/Drone DGCA Registration certificate (UIN) under Digital Sky Platform. 			
1.120		Preparation of detailed project report (excluding the cost of survey) along with evaluation of water requirement for required crop, designing the required intake civil structures and buildings etc., calculation of peak design discharge for Pressure Irrigation Network and pressurised pipelined flow along with pipe flow hydraulics, estimation of mechanical and electrical energy, along with selection of pumps and source of power connection, designing the layout or pipe network system along with field outlets, designing SCADA automation system and estimation of quantity of each, analysing the rates of required items as per approved material and cost by engineer in charge, preparation of abstract of cost of items and submission of DPR along with all drawings, designs and calculations including supply of 10 soft copies and 10 hard copies as per CWC guidelines and formats, along with getting it vetted from IIT or equivalent institutions and obtaining the approval	Hact	685.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		from CWC at all the required levels. The rate includes all material, labour, experts, T&P etc. required for proper completion of work including all lead and lifts etc., complete and as per direction of Engineer-In-Charge			
		Note			
		The above item is applicable only for projects which are Centrally Funded/Joint Venture of Central and State Government.			
1.121		Preparation of detail project report (excluding the cost of survey) along with evaluation of water requirement for required crop, designing and drawing of required intake civil structures and buildings etc., calculation of peak design discharge for Pressure Irrigation Network and pressurised pipelined flow along with pipe flow hydraulics, estimation of mechanical and electrical energy, along with selection of pumps and source of power connection, designing the layout or pipe network system along with field outlets, designing and drawings for SCADA automation system and estimation of quantity of each, analysing the rates of required items as per approved material and cost by engineer in charge, preparation of abstract of cost of items and submission of DPR along with all drawings, designs and calculations including supply of 10 soft copies and 10 hard copies as per departmental and CWC guidelines and formats, along with getting it vetted at all levels and obtaining the approval from BODHI. The rate includes all material, labour, experts, T&P etc. required for proper completion of work including all lead and lifts etc., complete and as per direction of Engineer In-Charge. Note: The above item is applicable only for state funded medium and major projects.	Hact	377.00	
1.122		Preparation of detail project report based on actual site, submergence and property survey, along with all hydrological and geological investigations, hydrological data collection including evaluation of			

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
		yield, flood estimations, silt studies and preparation of design, drawings & estimates of dam, gates and all its appurtenant works/structures, including E&M Parts, preparation of abstract of cost for items and submission of DPR along with all drawings, design and calculations including supply of 10 soft copies and 10 hard copies corrected volumes as per CWC and departmental guidelines and formats, along with getting it vetted at all levels and obtaining the approval from all required authorities. The rate includes all material, labour, experts, T&P etc., required for proper completion of work as per direction of Engineer-In-Charge of Dam. Note: This item is applicable for dams of capacity 30MCM or more including geotagging of above, all lead and lifts etc., complete.			
	1.122.1	From 30 MCM to 100 MCM	Mcm	80000.00	
	1.122.2	Above 100 MCM	Mcm	75000.00	
1.123		Providing and fixing canal information board of 1.2x0.75 m prepared on 16 gauge M.S. sheet with angle iron frame of size 35x35x3 mm with cross bracing of size 25x25x3mm including painting with one coat of zinc chromate storing primer and two coats each of green/ white back ground and back side grey store enameled bonded with red retro reflective sheet Engineering grade, border/ letters/ numeral/ arrows coated with non-peelable crystal clear protective transparent coat retaining 100% reflection including two angle iron post of size 50x50x5 mm of 3.65 m long inflated at bottom drilled on top and painted in white and black bonds of 30cm with four numbers high strength of G.I. bolts and nuts of size 10mm dia. and 20mm long sheet and angle iron post in one piece without joints including all taxes, conveying, fixing round with cement concrete in M-15 block of size 60x60x75 cm as directed including geotagging of above, all lead and lifts etc., complete.	No.	6880.00	
1.124		Making foundation and inauguration granite stone with vinyl print and pasting including cost of granite stone and figuring lettering and as directed including geotagging of above, all lead and lifts etc., complete.	Sqm	13500.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
1.125		Capacity training building, of social awareness, training of personnel's/ cultivators by social scientist/ (agency/ NGOs etc.,) for 5 years including conveyance, all expenses stationary, photography, as Videography & documentation, fooding, lodging, etc.,			
	1.125.1	A. Component of survey: 1. Soil Health Card -Listing of beneficiaries i.e. category wise (SC/ ST/ OBC/ Gen/ H/ TG) small and marginal farmer, soil health card.	Ha/ Year	500.00	
	1.125.2	2. Agricultural Statistics of Project. -Agricultural Statistics i.e. area wise detail of monocrop, double crop, multi crop, kharif and rabi crops recommendation along with soil health card. - Present crop pattern details bench marking. - Average input cost of crops at present of project.			
	1.125.2.1	(I) During 1st Year of construction.	Ha	1200.00	
	1.125.2.2	(ii) During 3rd Year of operation.	Ha	1200.00	
	1.125.2.3	3. Community survey & Community micro planning Community needs based action plan (with presence of at least 70% beneficiaries).			
	1.125.3.1	(I) During 1st Year of construction.	Ha	13000.00	
	1.125.3.2	(ii) During 3rd Year of operation.	Ha	10000.00	
	1.125.4	4. Geotagging of structure distribution network of micro & irrigation system including equipment.	Ha	100.00	
	1.125.5	B. Awareness campaign: General motivation Training, programme awareness of farmers, beneficiaries, WUA in order to adopt best practices of pressure/ micro irrigation {minimum 12 activity per year}.	Ha/ Year	700.00	
	1.125.6	Specialized Training Programme of farmers, beneficiaries by experts of Agriculture & horticulture (Minimum of 2 Training per season) in the first year of operation.	per training	25000.00	

Item No.		Description of item	Unit	Rate	REMARK
1		2	3	4	5
	1.125.7	Exposure visit of minimum 25 No. of farmers/ beneficiaries (one time needed)	One item	350000.00	
	1.125.8	Assistance for developing market base for produces	One item	200000.00	
	1.125.9	(C) Impact assessment- Conduct Third party Assessment by Govt Body/ Govt approved National/ State level Firm/ Institute after construction of project at the end of third year after second stage of micro planning.	Ha/ Year	5000.00	
	1.125.10	(D) Operation, Maintenance & Handover (Micro plan Committee)			
	1.125.10.1	Mobilization charges to run project for 5 years	Ha/ Year	2616.00	
	1.125.10.2	Social audit of scheme involving min 60% of the beneficiaries. (one time needed)	Ha/ Year	100.00	
	1.125.10.3	Operation, smooth hand maintenance over of project to the beneficiaries user committee or (WUA) for Operation & Maintenance.	Ha/ Year	1200.00	
1.126		Topographic survey for Bathymetry Survey of Reservoir using Trimble SPS855 DGPS Receiver, Geomax RTR system and Auto level including geotagging of above, all lead and lifts etc., complete.	Lkm	2200.00	
1.127		Single beam Bathymetry Survey using Bathy 500 Single beam echo sounder and accessories and Hypack data acquisition and survey vessel navigation software package including geotagging of above, all lead and lifts etc., complete.	Lkm	2500.00	
1.128		Sedimentation Studies using Sub Bottom profiler including geotagging of above, all lead and lifts etc., complete.	Lkm	5000.00	
1.129		Mathematical Modelling for preparing Elevation Area-Capacity table/ curve and cross section and L Section including sediment sampling analysis and including estimation of quantity of deposited sediment and including submission of report, analysis and result completing all aspects as mentioned in Terms of Reference including arrangement of Boat with Driver for sediment survey including Fuel and Maintenance including all lead and lifts etc., complete and as	Sqkm	8000.00	

Item No.	Description of item	Unit	Rate	REMARK
1	2	3	4	5
	directed by Engineer-in- Charge			
1.130	Water samples for suspended sediment concentration in mg/ lit are to be collected for each region given by CWPRS including geotagging of above. This process repeated for four regions. The collection of water samples shall be done once during non-monsoon period and once during monsoon period. Thus altogether (8) samples. The grain size distribution graph for suspended sediments shall be collected by using Van Dorn water sampler with required quantity of sea water. Water samples of sufficient quantity shall be collected for enabling the analysis of standard parameter (so that at least 20 g of sediment No. is available for grain size analysis). Samples are stored in plastic can have approved quality and transported at CWPRS for analysis of suspended sediment concentration (SSC). The analysis shall be carried out at CWPRS laboratory and the results shall be produced by CWPRS Laboratory with standard formats.	Per sample	20000.00	
	Survey of Anicut/ Weir/ Barrage/ Diversion schemes including chain and compass survey and levelling for river gradient up to 1 km each side at U/ S & D/ S @ 30 m distance, basin survey Grid @ 30 m C/C including plotting of contours, area capacity table for storage capacity of water in Anicut, and cross section of river and banks 100 m each sides beyond the bed of river @ 5 m interval including submission of 10 soft copies and 10 hard copies of plotting of above survey, level book and field book, geotagging of above, all lead and lifts etc., complete.	Per M length of Anicut		
1.131.1	Length of above structures up to 50 m	No.	173500.00	
1.131.2	Length of above structures from 50 m to 100 m	No.	228800.00	
1.131.3	Add for Additional 10 m Length above 100 m	No.	660.00	

CHAPTER-2

EXCAVATION AND EARTHWORK

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour/ manforce.
 - b) Running charges of machinery including rent fuel and lubricants, crew charges.
 - c) All materials required for execution of item of work.
 - d) All lead and lifts.
 - e) Removing all slips or falls in excavations.
 - f) Precautionary measures to be adopted in blasting as per IS 4081:1967 "Safety code of blasting" (as amended from time to time) and storing explosives as per "Explosives Rules 1940" corrected up to date.
 - g) Site clearance, layout and setting out of work.
3. Unless otherwise specified the basic rates are inclusive of loading & unloading, site clearance, haul roads, working under watery situation, de- silting but exclude dewatering and river diversion arrangement.
4. **Measurements:**
 - a) Measurements of earthwork will be taken by cross sectional measurements. Only when such measurements are not possible, pit measurements may be taken, but full measurements will be checked by Executive Engineer in charge.
 - b) In case of cross-sectional measurements of embankment/ filling the following deductions shall be made:

S.no.	Description	% deduction to be made in completed sectional measurement	%addition to designed height for shrinkage allowance
1	Earth work rolled, watered and compacted at optimum moisture content to maximum dry density.		
i	For embankment founded on unyielding (rock) foundations.	0.99	1
ii	For embankment founded on compressible (soil) foundations.	1.96	2
2	Earthwork rolled and watered (light rolling, i.e. by non- powered rollers/ hand ramming).	10	11

3	Earthwork rolled and not watered (Light rolling i.e. by non- powered rollers/hand ramming).	15	18
4	Earthwork neither rolled nor watered.	20	25
5	Earthwork neither rolled nor watered in case of clayey soils like Kanhar soil or black cotton soil.	25	33

- c) The above percentages shall be reduced to the following extent if measurements have been taken after:
- One rainy season has passed 50%
 - Two rainy seasons have passed 30%
 - More than two rainy seasons have passed 12.50%
- d) The length, breadth and depth (or height) shall be measured correct to the nearest cm. If the measurements are taken with level and staff, the levels shall be recorded correct to nearest 5mm. The area shall be calculated in sqm correct to two places of decimal and cubical contents in cum correct to two places of decimal.
- e) From the cross-sectional area of embankment, the area occupied by seepage drain, boulder toe, pitching, filters, sluice barrel, and parapet walls embedded in the earthwork or any other opening having area more than 0.1 sqm shall be deducted.
- f) No separate payment shall be admissible for housing.
- g) No deduction is admissible from the sectional measurements for voids of seepage drain, boulder toe, pitching, and filters.
5. **Classification of strata:** Effort required for excavation shall be the criteria for classification of strata. Power for classification of strata during excavation shall remain with the Executive Engineer. For excavated hard rock which is not likely to be useful for civil engineering works, verification of Superintending Engineer/ Chief Engineer before payment will be necessary.
- Soft/loose/hard/dense soils/ moorum with boulders and mud:** Generally, any soil which yields to the ordinary application of pick and shovel, or to spade, rake or other digging equipment, such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay, peat, cobble stones, moorum with boulders, mud etc. It shall include embedded rock boulders of size less than 1 meter in any dimension & not more than 200 mm in any of the other two dimensions, total cubic content up to 0.04 cum.
 - Soft/ disintegrated/ weathered rock (not requiring blasting):** Rock or boulder which may be quarried or split with crow bar. This will also include laterite and hard conglomerate. For this type of rocks, the core sample recovery is less than or equal to 0.50. This will also include boulders of size up to 1 meter in any dimension and more than 200 mm but less than 500 mm in any one of the

other two dimensions having total cubic content of more than 0.04 cum. This will also include any rock which in dry state may be hard requiring blasting, having core recovery more than 0.50 during excavation, but when wet or moist becomes soft and manageable by means other than blasting.

- c) **Hard rock (requiring blasting):** The type of strata which cannot be excavated with pick axes, crow bars etc., any rock or boulder, for excavation of which blasting is required for this type of rock, the core sample recovery shall be more than 0.50.
 - d) **Hard rock (requiring controlled blasting):** Due to any reason if general blasting is prohibited for rock excavation, controlled blasting shall be used with prior approval of Engineer in Charge. The core sample recovery for such rock shall be more than 0.50.
 - e) **Hard rock (blasting prohibited):** Hard rock requiring blasting as described in 5 (c) above but where blasting is prohibited for any reasons, breaking of rock shall be done by chiseling, wedging and barring mechanical rock breaker or by using hydraulic splitter and chemical substances mixed in an appropriate proportion or any other agreed method or any combination of above. The core sample recovery for such rock shall be more than 0.50 cum.
- 6. **Authority for classification:**
 - 7. **The classification shall be decided by the Executive Engineer and his decision shall be final.**
 - 8. **All excavated and embankment section shall be neatly dressed to the profile shown in drawing or as directed by Engineer- in- Charge.**
 - 9. **Dressing:**
 - a. Dressing is normally required at one place i.e., at the place of excavation or at the place of filling, hence the rates provided in the schedule include dressing only once, either at the place of cut or at the place of fill. In case of canal excavation, where earth is reused at or near the same place and for the same work, in such case only one dressing which is already included in the basic rates is admissible, even though the dressing is actually needed at both the places i.e., at the place of cut and at the place of fill, while additional rate for trimming in cutting only will be payable.
 - b. In case, dressing is not done either in cut or in fill or both, full rate for dressing will be reduced.
 - c. No separate payment for dressing or trimming of spoil banks and borrow areas shall be made.
 - 10. **Earth for embankment:**
 - a) In canal excavation the earth excavated from surplus reaches should be utilized in same and in adjoining deficit reaches so that the land acquisition for disposal of surplus earth and borrow areas in deficit reaches is reduced to a minimum. Accordingly, the surplus earth should be shifted to deficit reaches such that the surplus earth from excavation is utilized in the nearest reach first. For this purpose, on the basis of starting levels a shifting statement

for the canal network should be prepared which will form the basis for shifting of earth and computation of net payable quantity of earthwork and lead charges. When there are no deficit reaches where the surplus earth can be shifted, the surplus earth shall be disposed of in a planned manner with due regard to drainage arrangement.

- b) The lead for earthwork shall be measured from the center of borrow areas to the centre line of the dam/ embankment and shall be measured as crow flies, the crawly distance being measured from the geometrical centre of borrow areas to the centre of the dam/ embankment. While calculating the lead for payment and additional 5% over the distance calculated above shall be used to cover circuitous path.
 - c) Where canal embankment is proposed to be constructed with dam specifications, excavated moorum, soft rock, disintegrated rock may be utilized and duly compacted up to 2 m below bed level and the earthwork over this prepared surface shall be done with suitable soil. For such utilization additional payment for watering and compaction shall be payable.
- 11. Forming or leaving 'dead men' or 'tell-tales' in borrow pits and their removal after measurements.
 - 12. Where stacking of the material is done under specific orders of the Engineer in charge with a view to utilize, the entire materials on other items of works, rate for stacking shall be payable separately.
 - 13. Benching should be provided where the works are to be done on highly undulating/steeply sloping ground.

Note:

- a. Where FSL of the channel is below the ground level neither stripping nor ploughing and furrowing shall be done.
- b. Neither stripping nor benching shall be done for seat under spoil banks.
- c. The item of striping shall be payable for depth up to 15 cm only. If greater depths are to be removed, total depths are to be paid as per rates of general excavation of earthwork.

CHAPTER-2

EXCAVATION AND EARTHWORK

Schedule of Rates

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	5
2.01		Excavation in all kind of soft/ loose/ hard/ dense soils, spoil banks moorum and moorum mixed with boulders and mud including wet excavation dressing, placing the excavated soil neatly in specified dump area or disposing off the same as directed, including cost of dewatering, site clearance, all materials, machinery, labour and dressing, including all lead and lifts etc., complete.	Cum	160.00	
2.02		Excavation in soft/ disintegrated/ weathered rock including wet excavation, dressing, placing the excavated material neatly in specified dump area or disposing off the same as directed, including cost of dewatering, site clearance, all materials, machinery, labour and dressing, including all lead and lifts etc., complete.	Cum	371.00	
2.03		Excavation in hard rock of all toughness requiring blasting, minimising damage to rock beyond excavation line and placing the excavated rock neatly in specified dump area or disposing off the same as directed, including cost of dewatering, site clearance, all materials, machinery, labour and dressing, including all lead and lifts etc., complete.	Cum	1180.00	
2.04		Excavation in hard rock of all toughness (requiring controlled blasting), including control of vibration by use of delay detonators and control of fly-rock by muffling arrangements etc., and placing the excavated rock neatly in specified dump area or disposing off the same as directed, including cost of dewatering, site clearance, all materials, machinery, labour and dressing, including all lead and lifts etc., complete.	Cum	1535.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	5
2.05		Excavation in hard rock of all toughness (blasting prohibited), placing the excavated rock neatly in specified dump area or disposing off the same as directed, including cost of dewatering, site clearance, all materials, machinery, labour and dressing, including all lead and lifts etc., complete.	Cum	1771.00	
2.06		Deduction for construction Govt. excavated rock if used for construction.	Cum	248.00	
2.07		Earthwork			
	2.07.1	Earthwork for embankment (hearting/ casing) using selected soil from approved borrow areas in layers of 250 to 300 mm (before compaction) including cost of all materials, machinery, labour and dressing, all other operations such as collection of soil, spreading soil in layer of specified thickness, sorting out, breaking clods, levelling, sectioning edges/ sides, watering, compaction to achieve maximum dry density using sheep foot roller/ vibratory compactors including all lead and lifts etc., complete.	Cum	235.00	
	2.07.2	Earthwork for embankment (hearting/ casing) using selected soil from approved borrow areas in layers of 250 to 300 mm (before compaction) including cost of all materials, machinery, labour and dressing, all other operations such as collection of soil, spreading soil in layer of specified thickness, sorting out, breaking clods, levelling, sectioning edges/ sides including all lead and lifts. (excluding watering and compaction)	Cum	167.00	
2.08		Earthwork for cut off trench filling using selected impervious soil from approved borrow areas in layers of 250 to 300 mm (before compaction) including cost of site clearance, all materials, machinery, labour, dressing, all other operations such as collection of soil, spreading soil in layer of specified thickness, sorting out, breaking clods, levelling, watering, compaction to achieve maximum dry density using sheep	Cum	259.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	5
		foot roller/ vibratory compactors including all lead and lifts etc., complete.			
2.09		Compaction of earthwork			
	2.09.1	Compaction of earthwork at optimum moisture content to achieve maximum dry density by mechanical sheep foot roller/ vibratory compactors etc. including all lead and lifts. (excluding watering)	Cum	35.00	
	2.09.2	Compaction of earthwork at optimum moisture content to achieve maximum dry density by light roller i.e. non powered rollers or sheep foot roller or hand rammers including all lead and lifts. (excluding watering)	Cum	25.00	
2.10		Watering earthwork for compaction at optimum moisture content including all lead and lifts.	Cum	33.00	
2.11		Collection of boulders or rubble from excavated materials including stacking at suitable place including all lead and lifts.	Cum	207.00	
2.12		Dressing of Earthwork in			
	2.12.1	All type of soil including all lead and lifts.	Cum	14.00	
	2.12.2	All type of Rock (other than hard rock) including all lead and lifts.	Cum	33.00	

CHAPTER-3

DAM AND ALLIED WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include Cost of:**
 - a) Labour
 - b) Running charges of machinery including crew, fuel and lubricants.
 - c) All materials required for execution of item of work.
 - d) All leads and lift of materials, machines and labours.
 - e) Wastage of Cement, Sand, Coarse Aggregate, Admixture, Concrete, Mortar etc.
 - f) Shuttering, Scaffolding, Formwork, Vibration and Curing
 - g) Testing of materials and quality assurance measures including mix design.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items are inclusive of loading and un-loading, standard finish required for concrete work, cleaning/ preparation of cold and hot joints.
4. All the construction materials, workmanship and quality shall conform to the standards prescribed in IS Codes and Specifications/Guidelines/ Circulars of CG Water Resources Department.
5. For all nominal mixes, mix proportions shall be as per **IS 456:2000 (Reaffirmed 2011)**.
6. The rates of completed items are exclusive of cost of river diversion works.
7. **Measurements:** No deductions shall be made for the following
 - a) Volume occupied by reinforcement.
 - b) Opening up to 0.1 sqm in area.
 - c) Ends of dissimilar material for example beams, posts, girders, rafters, purlins, trusses, corbels and steps up to 0.5 sqm in cross section.
 - d) Opening up to 0.1 sqm in area (in calculating area of an opening, the thickness of separate lintel or sill shall be included in height).
 - e) Volume occupied by pipes, conduits sheathing, etc., not exceeding 0.1 sqm each in cross sectional area.
 - f) Moulds drip moulding, chamfers, splayed rounded or curved angles, bed grooves and rebates up to 10 cm in width or 15 cm in girth.
8. The table as per **IS 11155** show minimum concrete mix strength and maximum size of aggregate

to be used in various components of dam. The type of concrete mix may be selected accordingly.

S.No.	Structure	Maximum Size of Aggregate in mm	Desirable Minimum Concrete Grade
(i)	Spillway mass concrete	150	M 15
(ii)	Around opening with reinforcement	40/20	M 20
(iii)	1.5 to 2.5 m thick upstream face excluding crest of spillway	150	M 20
(iv)	Spillway crest (minimum 1.5 m thick on surface). Downstream Spillway face	80	M 20
(v)	Downstream Spillway bucket, stilling basin		
	a) All concrete in the top 0.6 m including baffle walls, end sills, chute blocks, etc.	40/20	M 25
	b) All concrete below 0.6 m from top surface.	80	M 20
(vi)	Retaining walls of spillway		
	a) Minimum 1.5 m on face	150	M 20
	b) Interior	150	M 15
	c) Reinforced retaining walls	80	M 20
(vii)	Irregularities of foundation	40/20	M 20
(viii)	Spillway piers and breast walls	80	M 20
(ix)	Spillway bridge deck		
	a) Beams	40/20	M 20
	b) Deck	20	M 20
(x)	Trash rack structure	40/20	M 20
(xi)	Block outs	20	M 20

Note: Maximum size of aggregate as shown in table may be changed by competent technical authority with due consideration of structural parameters and requirement of strength. (see IS 6512)

9. **Mass concrete:** Any volume of concrete cast in place (generally as a monolithic structure usually incorporating a high proportion of large coarse aggregate and a low cement content) and intended to resist applied load by virtue of its mass; it is distinct from other types of concrete because its dimensions are of such magnitude as to require that measures be taken to cope with the generation of heat and attain volume changes.
10. **Plain Cement Concrete (PCC):** Concrete containing no steel reinforcement or less amount of reinforcement than specified for reinforcement concrete in the code, the co-operation of such

steel being ignored in resisting stress resultant.

11. **Reinforced Cement Concrete (RCC):** Concrete containing steel reinforcement (non prestressed) conforming to IS Code and of not less than the minimum amount required by the code and is a composite material in which both material act in cooperation to resist the stress resultant.

Note: In addition to other relevant codes, PCC & RCC are mainly governed by IS 456:2000 and mass concrete by IS457:1957. Latest revision and reaffirmation with amendments.

12. (a) The proportion of materials for nominal mix shall be used as given in table 13 of specification Vol-I para 7.5.2.4.1 of page 7-32. It should be on the basis of weight of cement & aggregates Nominal mix proportion by volume under special circumstances may be permitted by the Chief Engineer/Superintending Engineer in-charge under written orders before commencing the work. A rough guide for the nominal mix proportion by volume will be 1:2:4, 1:1.5:3, 1:1:2, for, M-15, M- 20, & M-25 concrete respectively.

(b) For cement: which normally comes in bag and used by weight volume shall be worked out taking 50 kg. of cement as 0.035 cum in volume. The quantity of water per 50 kg. (0.035 cum.) of cement shall be as specified in table-13 of specification.

13. The proportioning of sand shall be done on the basis of its dry volume and in case of damp sand allowance for bulking shall be made based on volume measurement in accordance with **IS - 2386 (Part III):1963.**

14. For plum concrete the plum used shall be of 150-mm maximum size rubble or boulders.

15. **Measurements:**

(a) The following deductions will be made from stack measurements: -

- | | |
|--|-----|
| (i) Metal, Kanhar, gravel, shingle, stone chips and quarry spalls. | 8% |
| (ii) Moorum, sand, boulders, masonry stones, pitching stones and rubble. | 16% |
| (iii) Puddle earth. | 25% |

(b) Metal, moorum and sand for use on roadwork will be boxed for measurement in boxes measuring 1.5m x 1.5m x 0.5m.

(c) Boulders for use on roadwork will be stacked in regular stacks measuring 2.50 m x 5 m x 0.50 m.

(d) For other works if (b) and (c) cannot be followed the materials may be stacked in stacks with length and breadth in multiple of 1m.

16. The proportioning of single size aggregate for various cement concrete mixes shall be as per table given below:

Cement Concrete Mix	Maximum size aggregate specified	Parts of aggregate of single size				
		60 mm	40 mm	20 mm	12.5 mm	10 mm
C.C.1:2:4	63 mm	3	-	1	-	-
C.C.1:2:4	40 mm	-	2.5	1	-	0.5
C.C.1:2:4	20 mm	-	-	3	-	1
C.C.1:2:4	12.5 mm	-	-	-	3	1
C.C.1:1.5:3	63 mm	2.25	-	0.75	-	-
C.C.1:1.5:3	40 mm	-	1.88	0.75	-	0.37
C.C.1:1.5:3	20 mm	-	-	2	-	1
C.C.1:1.5:3	12.5 mm	-	-	-	2	1
C.C.1:1:2	63 mm	1.5	-	0.5	-	-
C.C.1:1:2	40 mm	-	1.25	0.5	-	0.25
C.C.1:1:2	20 mm	-	-	1.33	-	0.67
C.C.1:1:2	12.5 mm	-	-	-	1.33	0.67

The proportioning of aggregate for volumetric concrete mixes given in the above table may be varied marginally when considered necessary for obtaining better density and Strength. However, no adjustment in rate shall be made for any variation in proportioning of aggregate for works awarded on contract.

17. **Design mix concrete:** shall be mixed with cement contents as per design or minimum required as per table below

A - for reinforced concrete:

Concrete Mix	Minimum cement per cum of concrete	Specified characteristics compressive strength at 7 days	Specified characteristics compressive strength at 28 days
M-20	300 kg	13.5 N/sqmm	20 N/sqmm
M-25	300 kg	17.0 N/sqmm	25 N/sqmm

B - for plain cement concrete:

Concrete Mix	Minimum cement per cum of concrete	Specified characteristics compressive strength at 7 days	Specified characteristics compressive strength at 28 days
M-15	240kg	10.2 N/sqmm	15 N/sqmm
M-20	260kg	13.5 N/sqmm	20 N/sqmm
M-25	280kg	17.0 N/sqmm	25 N/sqmm

18. Masonry for masonry work up to 15 m height

(a) Classification of masonry:

- (i) **Plain ashlar:** every stone shall be cut to the required size and shape, chisel dressed on all beds and joints so as to be free from bushings dressed surface shall not show a depth of gap of more than 3 mm from straight edge placed on it. The exposed faces and joints, 6mm from the face shall be fine tooled so that a straight edge can be laid along the face of the stone in contact with every point. All visible angles and edges shall be true and square and free from chippings. The corner stones (quoins) shall be dressed and perpendicular.
- (ii) **Ashlar rough tooled:** The dressing of stone blocks shall be similar to plain ashlar except that face exposed in view shall have fine chisel draft 2.5cm wide round the edges and shall be rough tooled between the draft such that the dressed surface shall not deviate more than 3mm from the straight edge placed over it.
- (iii) **Ashlar rock (Quarried) faced:** The dressing of stone blocks in case of ashlar rock shall be similar to ashlar rough tooled except that the exposed faces of the stone between the drafts shall be left rough as the stone comes from the quarry; but no rock face or busing shall project more than 7.5 cm from place of drafts.
- (iv) **Squared rubble masonry coursed (first sort):** Face stones shall be hammer dressed on all beds and joints so as to give them approximately rectangular shape. These shall be square all joints & on bed. The bed joints shall be rough chisel dressed for at least 75 mm back from the face, and the side's joints at least 40mm back from the face, placed on it No portion of the dressed surface shall show a depth of gap more than 6mm from a straight edge placed on it. The remaining portion of the respective surfaces shall no project above the chisel dressed bed and side joints. The bushing on the face shall not project by more than 40mm on an exposed face.
- (v) **Squared rubble masonry coursed (second sort):** All requirements are the same as for coursed rubble masonry (first sort) except that no portion of dressed surface of joints shall show a depression of more than 10 mm (as against 6 mm for first sort) from the straight edge placed against the dressed surface.
- (vi) **Hammer dressed coursed rubble masonry:** Face stone shall be hammer dressed on all beds and joints, so as to give them approximately rectangular shape. The bed and side joints shall be hammer dressed for 75mm from face. The bushing on the face shall not be more than 4cm on the exposed face.
- (vii) **Random rubble or uncoursed masonry:** Stones used for uncoursed or random rubble masonry work shall be hammer dressed on the sides and bed in such a way as to close up with the adjacent stone in masonry work as strongly as possible. The face of stones shall be so dressed that bushing of the exposed face shall not project by more than 4 cm from the general wall surface.

- (b) **Bond Stones:** Through bond stones shall be provided in walls up to 60 cm thick and in case of walls above 60 cm thickness, a set of two or more bond stones overlapping each other by at least 15 cm shall be provided in line from face to back. Each bond stones or a set of bond stones shall be provided at 1.5 m to 1.8 m apart clear in each course. The bond stones shall be staggered in successive courses and marked for identification.
- (c) **Plum stones (Pin-header):** Pin header or plum stones shall be provided in hearting at about 1.8 m interval (both across and along). They shall run through the height of at least two courses. Their position shall be staggered in successive courses.
- (d) **Joints:** the maximum thickness of joints shall be 6 mm various types of ashlar masonry, 10 mm for squared rubble masonry coursed (first sort), 15mm for squared rubble masonry (second sort), 20mm for hammer dressed coursed rubble masonry and 35 mm for random rubble uncoursed masonry.
19. Masonry for masonry works having maximum height 15 m (height means structural height above lowest foundation level and is applicable for entire length of dams) and other massive structures:
- (a) **Face Masonry:** Face stones shall be hammer dressed on face and one line chisel dressed (finishing given to the stone face with no portion of it projecting more than 10 mm from the straight edge laid along the face of the stone) on bed, top and sides for a minimum depth of 75mm up to which the stones shall be true and rectangular. Beyond 75mm. Bushing on the faces of the stones shall not project more than 40 mm.
- (b) **Coursed rubble masonry:** Face stones shall be hammer dressed on face, on bed, sides and bed for 75 mm with the course normal to the face batter. The bushing on the faces of the stones shall not project more than 40mm.
- (c) **Random rubble masonry:** The hearing is of random rubble work.
20. **Stone block masonry:**
- a) Stone masonry blocks of size 29x19x14 cm actual (30x20x15cm nominal) shall be precast in cement concrete 1:3:6 with stone ballast of maximum size 20 mm and stone 5 to 15 cm in size. The quantity of stone pieces to be used in a block shall be about 33% by volume. Blocks of 1/3rd and 2/3rd of above size shall be used for bond purpose. The minimum average compressive strength of block shall be 5 N/sqmm.
- b) **The blocks shall be cast as per CBRI Technical Note No.7. The various steps in casting are as follows:**
- i. Apply oil (grease and kerosene oil 1:4 ratio) on casting platform and place the moulds in row.
 - ii. Arrange large size stone 12-cm size or so inside the mould, generally two or three stones will be laid.

- iii. Fill up the gaps between the stone pieces in the lower portion of the mould up to a height of about 5 cm with cement concrete of mix 1:4:8 and compact by trowel. The cement concrete should have low water cement ratio so as to give a stiff mix.
- iv. Fill up the remaining portion by placing 60 to 75 mm pieces in gaps and again pour the same cement concrete mix up to top and compact by roding/ tamping/ vibrating.
- v. The de-moulding is done after 3 to 4 minutes of casting the block by putting a wooded piece on top of the block cast and pulling the mould up.
- vi. The next day of casting, the blocks are turned upside down and stone texture kept exposed. The blocks are remixed and cured with water for 7 days and air dried for 3 weeks before using in masonry.

c) **Mortar:** Cement mortar 1:6 shall be used.

d) Laying the blocks shall be slightly wetted before or during laying in the wall, 1/3rd and 2/3rd size blocks shall be used for completing the bond. The thickness of joints shall be 1 cm and it shall be ensured that all horizontal and vertical joints are completely filled with mortar without any void left in masonry.

21. The payment for polygonal rubble walling shall be admissible as per the rates for item No 3.32.

22. (a) Where specifications of face masonry, differ from those of hearting, rate of face masonry will be payable as per actual width limited up to 60cm from the face.

(b) Double face masonry shall be payable for actual width or up to 60cm, whichever is less, for each side.

23. (a) The stones for masonry shall be hard, durable, tough, sound and clean. They should be free from decay, weathered faces, soft seams, adhering coating, sand holes, veins, flaws, cracks, stains and other defects and shall have, as far as possible, uniform colour and texture. Stones not uniform in colour, texture and / or with stains may be permitted after proper tests.

(b) Stones For Random Rubble masonry: The size of the stone shall be normally varied from 0.05 to 0.01 cum. No stone larger than the maximum specified size of 0.05 cum. should be used (in general). The stones shall be taken from quarries approved from the geological and engineer in charge consideration. The stone shall weigh less than 25 kg. the stones used in hearting shall be roughly cubical in shape. No stones weighing between 75 kg and 150 kg shall be less than 225 mm in any direction and no stone weighing between 25kg and 75 kg shall be less than 150 mm in any direction.

(c) Spalls with minimum dimension of 200mm to 100mm shall be used to wedge in to thick mortar spaces. They shall not normally exceed 10% of the volume of stone masonry.

24. The item of stripping shall be payable for depths up to 15cm only if greater depths have to be removed, total depths are to be paid as per rates of general excavation of earthwork.

25. In case of canal embankment, the stripping of seat should normally be limited to 8cm, for canal discharge up to 3 cumecs and embankment height above 1.5m only furrowing and plugging be done for embankments of height less than 1.5m stripping of seat be done for 15cm for canal discharge more than 3 cumecs and embankment of height less than 0.6, for such canals.
26. Stripping the seat of embankment should not be payable in the area covered by benching the seat of embankment.
27. The rates for excavation of puddle trench includes the cost of cutting and subsequent removal, if ordered, in steps required in deep trenches for the inspecting officers and the working labours to go down and come up. However, it does not include filling up of these steps either by puddle or by earth.
28. The rates for puddle trench excavation, provided in this chapter, are not payable for cut off trench excavation.
29. For items of filter locally available shingle or gravel be use as a first preference. If it is not available locally, metal from excavation of hard moorum with boulder – or rock- cut be used as second alternative, provided it is certified by the Executive Engineer while obtaining sanction to the estimate, that shingle or gravel is not available from nearby nalla or rivers.
30. For use of metal for filter the extra rate for blasting shall not be payable.
31. In hand packed stone pitching of 45 cm thick in two layers header stone of size 45x30x30 cm extending through both layers and spaced at about 1.5 m apart shall be used.
32. The rates for drilling are inclusive of cost of taking out cores, logging, labelling and preservation of cores, maintained in serial order and painting depths on cores and on the core box, and protection of drill holes till final measurements.
33. All items where use of water is required are inclusive or water charges and Air charges and no separate payment is to be made for.
34. Rates for drilling are inclusive of taking out relatively undisturbed sample (penetration samples) in soil.
35. Rates for drilling are exclusive of the cost of special washing and conducting percolation tests.
36. When casing pipes are to be left permanently in the holes, rate for drilling shall be inclusive of labour for fixing casing pipes, but exclusive of the cost of casing pipes.
37. The rates for drilling are inclusive of all charges for fixing casing pipes, to the extent necessary and taking out the same after final measurement.

38. **Measurements:**

- a. The linear dimensions shall be measured correct to the nearest 0.01 m. The area shall be worked out in sqm correct to two places of decimal and cubical contents in cum correct to two places of decimal.
- b. The measurement for all types of grouting shall be made on the basis of cement in the grout actually forced into the holes.
- c. The method of recording, the details of grouting operation and determining the quantity of grout consumed may be adopted as under.
 - (i) For measurement of the quantity of grout injected in each hole, a grout history sheet on proforma given below shall be recorded giving grout intake per minute, viscosity of grout mix in form of solids and water ratio, pressure of injection, time of pumping in water for lubrication, event of blowing of grout, to keep the grouting system alive. In addition, various other points of importance observed during the operation of grouting are recorded for every 5-10 minutes intervals and thus the grout history sheet when plotted shall depict the exact amount of grout injected.

Actually, this graph from the grout history sheet should be plotted and form the basis of measurement and payment on actual basis and to depict the factual amount of grout injected. The area under the curve shall represent the quantity of grout actually injected. A register shall be maintained of 100 such sheets. Each sheet shall be machine numbered on both sides.

- (ii) Recording of the surface leakage, if any, shall be made in the remark column of the grout history sheet showing the location. The leakage should be immediately stopped by reducing the pressure and caulking suitably. The grout should not be allowed to leak more than 5 percent by visual judgement.
- (iii) Measurement of cement, blown off and circulated in the grout lines, shall be separately recorded in mass of cement actually used for purposes of accounting the cement actually used for the enabling works.
- (iv) In case of stage grouting of the hole, cement grouted in each stage shall be summed up.

IS code/IRC No	Title
SP-23-1982	Hand Book on Concrete Mixes
SP 24-1983	Explanatory Handbook on Indian Standard Code of Practice for Plain and Reinforced Concrete (IS 456:1978)
SP 55: 1993	Design Aid for Anchorages for Spillway Piers, Training Walls and Divide Walls. (Reaffirmed 2010)
IS 341:1973	Specification for black Japan, types A, B and C (Reaffirmed 2002)
IS 383:1970	Specification for Coarse and Fine Aggregates from Natural Sources for Concrete. (Reaffirmed 2002)

IS 455:1989	Specification for Port Land slag Cement (Fourth Revision) (Amendment No.1,2,3,4,5,6&7) (Reaffirmed 2014)
IS 456:2000	Code of Practice for Plain and Reinforced Concrete (Third Revision) (Reaffirmed 2011) (With Amendment No.1 To 4).
IS 457:1957	Code of Practice for General Construction of Plain and Reinforced Concrete for Dam and other Massive Structures. (Reaffirmed 2014)
IS 516:1959	Method of Test for Strength of Concrete (Amdt.No.1) (Reaffirmed 2013)
IS 1199:1959	Method of Sampling and Analysis of Concrete (Reaffirmed 2013)
IS 1489:2015	Portland Pozzolana Cement Specification Part 1 Fly Ash Based
IS 1542:1992	Sand for Plaster (First Revision) (Reaffirmed 2003)
IS 2116:1980	Sand for Masonry Mortars (First Revision) (Reaffirmed 2012)
IS 2250:1981	Preparation and Use of Masonry Mortar (First Revision) (Reaffirmed 2010)
IS 2402:1963	Code of Practice for External Rendered Finishes (Reaffirmed 2006)
IS 2430:1986	Method for Sampling of Aggregates for Concrete. (Reaffirmed 2014)
IS 2505:1998	General Requirements for Concrete- Vibrators, Immersion Type (Second Revision). (Reaffirmed 2004)
IS 2506:1985	General Requirement for Screed Board Concrete Vibrators. (Reaffirmed 2005)
IS 2720(II):1973	Determination of water content (Reaffirmed 2014)
IS 2720(XIV):1973	Determination of density index (relative density) of cohesionless soils (Reaffirmed 2006)
IS 2750:1964	Steel Scaffoldings (With Amendments No 1 To 3) (Reaffirmed 2006)
IS 2933:1975	Specification for Enamel, Exterior, (a) undercoating (b) finishing. (Reaffirmed 2009)
IS 3589:2001	Steel pipes for water and sewage (168.3 to 2540mm outside diameter) specification
IS 3696 (Part D):1987	Safety Code for Scaffolds and Ladders: Part-1 Scaffolds. (Reaffirmed 2007)
IS 4081-1986	Safety code for Blasting and related drilling operations. (Reaffirmed 2005)
IS 4082-1996	Stacking and storage of Construction Material at Site (First Revision) (Reaffirmed 2003)
IS 4925-2004	Specification for Concrete Batching and Mixing Plant. (Reaffirmed 2005)

IS 6066-1994	Recommendations for Pressure Grouting of Rock Foundations in River Valley Projects. (Reaffirmed 2013)
IS 6512:1984	Criteria for Design of Solid Gravity Dams (First Revision) (Reaffirmed 2013)
IS 7319-1974	Specification for perforated concrete pipes. (Reaffirmed 2005)
IS 7816(I)-1975	Guide for testing insulation resistance of rotating machines.
IS 7861-(Pt-1)-1975	Code of Practice for Extreme Weather Concreting Part-1 Hot Weather. (Reaffirmed 2011) (Amendment No.-1)
IS 7864(1)-1975	Specification for upholstery springs. Part I conical type (Reaffirmed 2003).
IS.8237-1985	Code of Practice for Protection of Slope of Reservoir Embankments (Reaffirmed 2012).
IS 8605:1977	Code of Practice for Construction for Masonry in Dams. (Reaffirmed 2013)
IS 8826:1978	Guidelines for Design of Large Earth and Rock Fill Dams (Reaffirmed 2013) (Amendment No. 1)
IS 9103-1999	Specification for Admixture for Concrete. (First Revision) (Reaffirmed 2013) (Amendment No. 2)
IS 9429:1999	Code of Practice for Drainage System of Earth and Rock Fill Dams (First Revision) (Reaffirmed 2013)
IS 9556:1980	Code of practice for design and construction of diaphragm walls.
IS.9759-1981	Guidelines for Dewatering During Construction. (Reaffirmed 2003)
IS 10135:1985	Code of Practice for Drainage System for Gravity Dams, Their Foundations and Abutments. (First Revision) (Reaffirmed 2013)
IS 10262	Code of Practice for Concrete Mix Design. (Reaffirmed 2009)
IS 11155:1994	Construction of Spillways and Similar overflow Structures-Code of Practice (First Revision) (Reaffirmed 2010) (Amendment No. 1)
IS 11216:1985	Code of Practice for Permeability Test for Masonry (During and after Construction) (Reaffirmed 2013)
IS 12169:1987	Criteria for Design of Small Embankment Dams. (Reaffirmed 2013) (Amendment No. 1)
IS 12200:2001	Provision for Water Stops at Transverse Contraction Joints in Masonry and Concrete Dams Code of Practice (First Revision) (Reaffirmed 2013)
IS 13645:1993	Guidelines for Guniting the Upstream Face of Masonry Dams (Reaffirmed 2013) (Amendment No.1)
IS 14591:1999	Temperature Control of Mass Concrete for Dams-Guidelines (Reaffirmed 2010)

IS 14690:1999	Quality Control During Construction of Earth and Rock Fill Dams-Recommendations (Reaffirmed 2010)
IS 14954:2001	Distress and Remedial Measures in Earth and Rock Fill Dams Guidelines (Reaffirmed 2013)
IS 15058:2002	Specification for PVC Water Stops at Transverse Contraction Joints in Masonry and Concrete Dams (Reaffirmed 2013)
IS 269 – 1989	Specification for 33 grade ordinary Portland cement (fourth revision) (Reaffirmed 2004)
IS 1343-1980	Code of practice for prestress concrete (Reaffirmed 2004)
IS 2430 - 1986	Method for sampling of aggregates for concrete. (Reaffirmed 2005)
IS 4031-1988 (Pt. 1 to 13)	Method of physical tests for hydraulic cement.
IS 4032-1985	Method of chemical analysis of hydraulic cement (Reaffirmed 2005)
IS 8112-1989	Specification for 43 grades ordinary portland cement (Amdt. No. 1,2,3,4,5&6) (Reaffirmed 2005)
IS 1129-1972	Recommendation for dressing of material, building stones (first revision) (Reaffirmed 2003)
IS 1597-1992	Code of practice for construction of stone masonry (Reaffirmed 2007)
IS 1597 (Part I) – 1992	Code of Practice for construction of stone masonry-Rubble stone masonry. (Reaffirmed 2007)
IS 1597 (Part II) - 1967	Code of practice for construction of stone masonry-Ashlar masonry
IS 2185-Pt.-I-2005	Hollow and solid concrete blocks (second revision)
IS 2185-Pt.-II-1983	Hollow and solid light weight concrete blocks (first revision) (Reaffirmed 2005)
IS 4078-1980	Code of practice for indexing and storage drill cores (first revision). (Re 2000)
IS 4464-1985	Code of practice for Presentation of drilling information and core description in foundation investigation. Re 2000
IS 4999-1991	Recommendations for grouting of previous soils. Re 1999
IS 5541-1970	Pneumatic portable drilling machine (with amendment No.1) Re 1998 6066-1994 Recommendations for pressure grouting of rock foundations in river valley projects. Re 2004
IS 6926-1996	Code of practice for diamond drilling for site investigation for river valley projects. Re 2006

CHAPTER-3
DAM AND ALLIED WORKS
Schedule of Rates

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		EXCAVATION & FOUNDATION TREATMENT WORKS:			
3.01		Preparing foundation bed for masonry or concrete by removing all loose material by wedging/ chiseling up to 150 mm and disposing off the same as directed and cleaning the surface with air and water jet including cost of all materials, machinery, labour and all other ancillary operations complete including all lead and lifts.	Sqm	60.00	
3.02		Preparing foundation bed for cut-off trench filling in rock portion by removing all loose materials by wedging/ chiseling up to 150 mm and disposing off the same as directed and all other ancillary operations complete including all lead and lifts.	Sqm	36.00	
3.03	3.03.1	Drilling 50 to 75 mm diameter holes vertical or inclined up to 10 degrees to vertical in rock/ masonry/ concrete by percussion drilling method using wagon drill or any other suitable equipment including cost of all materials, machinery, labour, redrilling through partially set grout wherever required and all other ancillary operations complete including all lead and lifts.			
	3.03.1.1	0 m to 6 m from surface:	Rm	615.00	
	3.03.1.2	Beyond 6 m depth from surface add 10% extra on Item 3.03.1.1 for every 6 m. additional depth	Rm	62.00	
		Beyond 6 m up to 12 m from surface:	Rm	677.00	
		Beyond 12 m up to 18 m from surface:	Rm	744.00	
		Beyond 18 m up to 24 m from surface:	Rm	819.00	
		Beyond 24 m up to 30 m from surface:	Rm	900.00	
		Beyond 30 m up to 36 m from surface:	Rm	991.00	
		Beyond 36 m up to 42 m from surface:	Rm	1090.00	
		Beyond 42 m up to 48 m from surface:	Rm	1199.00	
	3.03.2	Redrilling (percussion) set or partially set grout holes	Rm	74.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.04	3.04.1	Wet percussion drilling 50 to 75 mm dia. holes in drainage gallery, for grouting, drainage holes or anchor etc., vertical or at specified inclination, in masonry concrete or rock and all other ancillary operations complete including all lead and lifts.			
		up to 10 m depth:			
	3.04.1.1	0° to 10° vertically downwards	M	1428.00	
	3.04.1.2	Exceeding 10° but not exceeding 45° vertically downwards.	M	1571.00	
	3.04.1.3	0° to 45° vertically upwards	M	1999.00	
	3.04.1.4	Up to but not including 45° to the horizontal.	M	1714.00	
	3.04.2	from 10 to 20 m depth:			
	3.04.2.1	0° to 45° vertically upwards	M	1571.00	
	3.04.2.2	Exceeding 10° but not exceeding 45° vertically downwards.	M	1728.00	
	3.04.2.3	0° to 45° vertically upwards	M	2199.00	
	3.04.2.4	Up to but not including 45° to the horizontal.	M	1885.00	
	3.04.3	More than 20 m depth			
	3.04.3.1	0° to 10° vertically downwards	M	1714.00	
	3.04.3.2	Exceeding 10° but not exceeding 45° vertically downwards.	M	1885.00	
	3.04.3.3	0° to 45° vertically upwards	M	2399.00	
	3.04.3.4	Up to but not including 45° to the horizontal.	M	2057.00	
3.05		Re-drilling (wet percussion) set or partially set grout holes for Items no.3.04.1	Rm	286.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.06		Conducting percolation test in the drill holes at the desired pressure including water supply arrangements and necessary accessories with all other ancillary operations complete including all lead and lifts.			
	3.06.1	Up to 10 m depth	Each	970.00	
	3.06.2	Add extra beyond 10 m depth for every addition of 10 m depth or part thereof.	Each	194.00	
3.07		Conducting standard penetration test in the bore holes at every 1.5 m interval from the desired elevation including cost of all accessories and arranging of cores from depths as obtained with all other ancillary operations complete including all lead and lifts.			
	3.07.1	Up to 10 m depth	Each	1165.00	
	3.07.2	Add extra beyond 10 m depth for every addition of 10m depth or part thereof.	Each	233.00	
3.08		Flushing grout holes of all sizes with water and air jets alternatively for an average period of 30 minutes and observing water intake after flushing including cost of all materials, machinery, labour and all other ancillary operations complete including all lead and lifts.	Rm	115.00	
3.09		Stripping the seat of embankment of all foreign materials, vegetation and other growth like grass roots etc., and removing the rubbish up to a suitable distance including dressing but excluding jungle clearance and all other ancillary operations complete including all lead and lifts.	Cum	176.00	
3.10		Benching the seat of embankment to an average depth of 15 cm and cross slope of 1 in 12 including cleaning of all foreign material, vegetation and other growth like grass and plant roots and removing the rubbish up to a suitable distance with dressing and all other ancillary operations complete including all lead and lifts.	Cum	192.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		GROUTING			
3.11		Consolidation grouting with neat cement grout mix of suitable consistency under specified grout pressure as directed in drilled holes by stage grouting method including cost of all materials, machinery, labour, redrilling, if necessary, required admixtures with all other ancillary operations complete including all lead and lifts.	Tonne	11458.00	
3.12		Curtain grouting with neat cement grout mix of suitable consistency under specified grout pressure as directed in drilled holes by stage grouting method including cost of all materials, machinery, labour, redrilling, if necessary, required admixtures with all other ancillary operations complete including all lead and lifts.	Tonne	12700.00	
3.13		Providing and fixing up-heaval gauge with all accessories as per specifications excluding cost of drilling holes including cost of all other materials, machinery, labour, equipment's and all other ancillary operations complete including all lead and lifts.	Each	3231.00	
3.14		Providing and fixing 25 mm dia. 3 m long High Strength Deformed Steel Bars with one end driven into 38 mm diameter 1.50 m deep hole drilled in bed rock and other end provided with L-bend for embedding in concrete/ masonry of over flow/ non-over flow blocks and other appurtenant works including cost of all materials, machinery, labour, drilling and cleaning hole, filling hole with specified cement mortar, driving anchor rod and all other ancillary operations complete including all lead and lifts.	Each	1392.00	
3.15		Providing and fixing 25 mm dia. 2.75 m long ribbed steel anchor rods with one end split and driven firmly using steel wedge into 1.25 m deep 38 mm dia. hole drilled in bed rock and other end provided with L-bend for embedding in concrete/ masonry for spillway and	Each	1329.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		appurtenant works including cost of all materials, machinery, labour, steel wedge, drilling and cleaning hole, filling hole with thick cement slurry, driving anchor rod and all other ancillary operations complete including all lead and lifts.			
		REINFORCEMENT AND CEMENT CONCRETE WORKS:			
3.16		Providing, fabricating and placing in position steel reinforcement bars for Reinforced cement concrete/ Plain Cement Concrete structures including cost of all materials, machinery, labour, cleaning, straightening, cutting, bending, hooking, lapping/ welding joints wherever required, tying with 1.25 mm diameter soft annealed steel wire, and all other ancillary operations complete including all lead and lifts.	Kg	81.65	
3.17		Providing and laying M15 grade Mass Concrete design mix using graded aggregates, clean, hard, including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size			
	3.17.1	150 mm (25%) and 40 mm (75%) Plum concrete	Cum	4406.00	
	3.17.2	80 mm	Cum	4342.00	
	3.17.3	40 mm	Cum	4476.00	
3.18		Providing and laying M20 grade Mass Concrete design mix using graded aggregate, clean, hard including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing,			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size.			
	3.18.1	150 mm (25%) and 40 mm (75%) Plum concrete	Cum	4547.00	
	3.18.2	80 mm	Cum	4576.00	
	3.18.3	40 mm	Cum	4764.00	
3.19		Providing and laying M25 grade Mass Concrete design mix using graded aggregate, clean, hard including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size: -			
	3.19.1	80 mm	Cum	4782.00	
	3.19.2	40 mm	Cum	5124.00	
3.20		Providing and laying M15 grade Plain Cement Concrete design mix using graded aggregate, clean, hard including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size.			
	3.20.1	40 mm	Cum	5275.00	
	3.20.2	20 mm	Cum	5391.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.21		Providing and laying M20 grade Plain Cement Concrete design mix using graded aggregate, clean, hard including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size.			
	3.21.1	40 mm	Cum	5487.00	
	3.21.2	20 mm	Cum	5701.00	
3.22		Providing and laying M25 grade Plain Cement Concrete design mix using graded aggregates clean, hard and, including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering, and all other ancillary operations complete including all lead and lifts.			
		using aggregate of maximum size.			
	3.22.1	40 mm	Cum	6077.00	
	3.22.2	20 mm	Cum	6291.00	
3.23		Providing and laying M20 grade Reinforced Cement Concrete design mix using graded aggregate, clean, hard including cost of all materials (excluding cost of providing and placing reinforcement steel/ bars), machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering, and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size: -			
	3.23.1	40 mm	Cum	6138.00	
	3.23.2	20 mm	Cum	6352.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.24		Providing and laying M25 grade Reinforced Cement Concrete design mix using graded aggregate, clean, hard including cost of all materials (excluding cost of providing and placing reinforcement steel/ bars), machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering, and all other ancillary operations complete including all lead and lifts.			
		Using aggregate of maximum size: -			
	3.24.1	40 mm	Cum	6665.00	
	3.24.2	20 mm	Cum	6879.00	
3.25		Providing and laying M20 grade RCC design mix using 20 mm graded aggregates, clean, hard for solid parapet (as per Annexure-XIV) consisting of 350 x 200 mm kerb, 350 x 350 x 1000 mm pillars spaced approximately at 3.35 m c/c, 125 mm thick wall 800 mm height with 125 mm thick and 350 mm wide coping slab for wall and 125 mm thick 400 x 400 mm coping for pillars with top edges of kerb and coping chamfered or rounded as directed including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, and all other ancillary operations complete including all lead and lifts.(excluding cost of providing and placing reinforcement steel and gate).	M	3117.00	
3.26		Providing and laying M20 grade RCC design mix using 20 mm graded aggregates, clean, hard for ornamental parapet (as per Annexure-XII) consisting of 350 x 200 mm kerb, 350 x 350 x 1000 mm pillars spaced approximately at 3.5 m apart, 200 x 150 mm posts 800 mm height approximately 300 mm c/c with 125 mm thick and 350 mm wide coping slab for posts 400 x 400 x 125 mm coping slab for pillars with top edges of kerb and coping chamfered or rounded as directed including cost of all	M	3315.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, and all other ancillary operations complete including all lead and lifts. (excluding cost of providing and placing reinforcement steel and gate).			
3.27		M25 RCC diaphragm wall with graded aggregate of maximum size 20 mm excavating trench, reinforcement, grouting of joints, performance of all test and trimming top 0.50 m including cost of all operations including all lead and lifts, and all other ancillary operations complete in all respect (Steel 40 kg per cum)	Cum	26122.00	
3.28		Pre-cooling to control placement temperature of cement concrete in the range of 12 to 18°C at the concrete placement point by inundation of coarse aggregates by circulating normal water and using flaked ice and water chilled up to 4° C for mixing concrete including cost of all materials, machinery, labour and all other ancillary operations complete including all lead and lifts.	Cum	124.00	
3.29		Providing and forming porous (without sand) concrete precast body drain of size 400 x 400 x 200 mm with 200 mm diameter central hole using cement and 20 mm down approved, clean, hard, graded coarse aggregates in 1:5 proportion by weight including cost of all materials, machinery, labour, formwork, batching, mixing, placing in position, tamping, curing and all other ancillary operations complete including all lead and lifts.	Cum	6183.00	
		MASONRY AND GUNITING WORKS:			
3.30		Providing and constructing un-coursed rubble stone masonry using approved stones in cement mortar including cost of all materials, machinery, labour, scaffolding, cleaning, packing mortar and wedging stone chips into joints, curing and all other ancillary operations complete including all lead and lifts.			
	3.30.1	(Strength 14 N/sqmm) CM 1:3	Cum	3967.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
	3.30.2	(Strength 10.5 N/sqmm) CM 1:4	Cum	3663.00	
		Providing and constructing coursed rubble face stone masonry using approved stones in cement mortar including cost of all materials, machinery, labour, scaffolding, cleaning, packing mortar and wedging stone chips into joints, curing and all other ancillary operations complete including all lead and lifts.			
	3.31.1	(Strength 14 N/ sqmm) CM 1:3	Cum	4258.00	
	3.31.2	(Strength 10.5 N/ sqmm) CM 1:4	Cum	3977.00	
3.32		Providing and constructing chisel and hammer dressed face stone masonry with approved stones in cement mortar including cost of all materials, machinery, labour, scaffolding, ramps, cleaning, packing mortar and wedging stone chips into joints, curing and all other ancillary operations complete including all lead and lifts.			
	3.32.1	(Strength 14 N/ sqmm) CM 1:3	Cum	4400.00	
	3.32.2	(Strength 10.5 N/ sqmm) CM 1:4	Cum	4235.00	
3.33		Providing average 50 mm deep cement mortar flush pointing to face stone masonry in Cement mortar including cost of all materials, labour, raking-out and cleaning joints, pressing mortar into joints, scaffolding, finishing, curing and all other ancillary operations complete including all lead and lifts.			
	3.33.1	Cement Mortar 1:2	Sqm	114.00	
	3.33.2	Cement mortar 1: 3	Sqm	105.00	
		CONTRACTION JOINT WORKS:			
3.34		Providing in contraction joints by fixing 225 mm wide central bulb type PVC water stop transparent or white in colour in single line supported by 10 mm dia. steel dowel rods on either side at 1 meter interval including cost of	M	1158.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		all materials, machinery, labour, vulcanizing water seal joints and all other ancillary operations complete including all lead and lifts.			
		EARTH/ ROCKFILL EMBANKMENT WORKS:			
3.35		Earthwork for embankment adjacent to masonry/ concrete structures key wall, sluice barrel etc. and filling trial pits using selected soil from approved borrow area in layers of 100 to 150 mm (before compaction) including cost of all materials, machinery, labour, all other operations such as collection of soil, picking previous layer, spreading soil in layer of specified thickness, sorting out, breaking clods, levelling, sectioning edges/ sides, watering, compacting to maximum dry density using pneumatic tampers/ vibrating earth rammers and all other ancillary operations complete including all lead and lifts.	Cum	259.00	
3.36		Providing and constructing rockfill embankment using 300 mm downgraded stones and quarry spalls from approved source including cost of all materials, machinery, labour, spreading stones and spalls in layers, hand packing, wedging, compaction by pneumatic/ temper/ vibratory earth rammer, finishing the surface to required slopes as per approved drawings and all other ancillary operations complete including all lead and lifts.	Cum	652.00	
3.37		Puddle filling of good clay including mixing watering and kneading by temping, ramming and laying and all other ancillary operations complete including all lead and lifts.	Cum	429.00	
3.38		Construction of seepage drains 60x60 cm under the bund, (excluding excavation of trenches) filling the drains with graded materials such as boulder, shingle and sand in layers, and laying and all other ancillary operations complete including all lead and lifts as per specifications.			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
	3.38.1	Drains filled in layers with stones, shingle and sand.	M	305.00	
3.39		Construction of seepage drains 75x75cm under the bund (excluding excavation of trench) filling the drains with graded materials such as boulders, shingle and sand in layers and all other ancillary operations complete including all lead and lifts as per specification.			
	3.39.1	Drains filled in layers, with quarried stones, shingle and sand.	M	417.00	
3.40		Construction of seepage drains 90x90 cm under the bund (excluding excavation of trench) filling in drains with graded materials, such as boulders, shingle and sand in layers and all other ancillary operations complete including all lead and lifts as per specification.			
	3.40.1	Drains filled in layers with quarried stones, shingle and sand.	M	599.00	
3.41		Providing and constructing longitudinal/ cross drains trapezoidal in shape with 1 m bottom width and depth of 0.9 m having side slope of 1:1 with graded filter having 150 mm thick sand & metal layer, and 300 mm thick rubble layer from approved source satisfying specified filter criteria in layers of specified thickness including cost of all materials, machinery, labour, laying to required slopes, compaction and all other ancillary operations complete including all lead and lifts. as per specification and approved drawings. Note: - Excavation will be paid separately same as per excavation rate.			
	3.41.1	Sand	Cum	1736.00	
	3.41.2	Aggregate 40 mm Graded Metal	Cum	1366.00	
	3.41.3	Rubble	Cum	881.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.42		Providing filter blanket horizontally, including laying, spreading, packing and all other ancillary operations complete in layers of required thickness but excluding excavation of foundation including all lead and lifts.			
	3.42.1	Aggregate 80 mm Graded Metal.	Cum	1252.00	
	3.42.2	Aggregate 60 mm Graded Metal.	Cum	1345.00	
	3.42.3	Aggregate 40 mm Graded Metal.	Cum	1371.00	
	3.42.4	Aggregate 20 mm Graded Metal.	Cum	1355.00	
	3.42.5	Aggregate 10 mm Graded Metal.	Cum	1209.00	
	3.42.6	Shingle 80 mm or 60 mm Graded Metal.	Cum	676.00	
	3.42.7	Shingle 40 mm Graded Metal.	Cum	1373.00	
	3.42.8	Shingle 20 mm Graded Metal.	Cum	1537.00	
	3.42.9	Shingle 10 mm Graded Metal.	Cum	1209.00	
	3.42.10	Sand passing through 4.75 mm screen.	Cum	1737.00	
3.43		Providing filter blanket on inclined surface steeper than 1 in 5 and chimney filter, including laying, spreading, packing and all other ancillary operations complete in layers of required thickness but excluding excavation of foundation including all lead and lifts.			
	3.43.1	On inclined surfaces steeper than 1 in 5			
	3.43.1.1	Aggregate 80 mm Graded Metal.	Cum	1378.00	
	3.43.1.2	Aggregate 60 mm Graded Metal.	Cum	1480.00	
	3.43.1.3	Aggregate 40 mm Graded Metal.	Cum	1509.00	
	3.43.1.4	Aggregate 20 mm Graded Metal.	Cum	1491.00	
	3.43.1.5	Aggregate 10 mm Graded Metal.	Cum	1330.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
	3.43.1.6	Shingle 80 mm or 60 mm Graded Metal.	Cum	744.00	
	3.43.1.7	Shingle 40 mm Graded Metal.	Cum	1511.00	
	3.43.1.8	Shingle 20 mm Graded Metal.	Cum	1691.00	
	3.43.1.9	Shingle 10 mm Graded Metal.	Cum	1330.00	
	3.43.1.10	Sand passing through 4.75 mm screen.	Cum	1911.00	
	3.43.2	For chimney filter			
	3.43.2.1	Aggregate 80 mm Graded Metal.	Cum	1503.00	
	3.43.2.2	Aggregate 60 mm Graded Metal.	Cum	1614.00	
	3.43.2.3	Aggregate 40 mm Graded Metal.	Cum	1646.00	
	3.43.2.4	Aggregate 20 mm Graded Metal.	Cum	1626.00	
	3.43.2.5	Aggregate 10 mm Graded Metal.	Cum	1451.00	
	3.43.2.6	Shingle 80 mm or 60 mm Graded Metal.	Cum	812.00	
	3.43.2.7	Shingle 40 mm Graded Metal.	Cum	1648.00	
	3.43.2.8	Shingle 20 mm Graded Metal.	Cum	1845.00	
	3.43.2.9	Shingle 10 mm Graded Metal.	Cum	1451.00	
	3.43.2.10	Sand passing through 4.75 mm screen.	Cum	2085.00	
3.44		Construction of rock toe in earthen embankments Including laying and hand packing, dressing, wedging and finishing over surface and all other ancillary operations complete including all lead and lifts.			
	3.44.1	Boulders	Cum	791.00	
	3.44.2	Quarried stone			
	3.44.2.1	Other than black trap, basalt or granite	Cum	868.00	
	3.44.2.2	Black trap, basalt or granite	Cum	981.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.45		Filling foundations around masonry works with suitable soil obtained from spoil banks or borrow areas including watering and ramming and all other ancillary operations complete including all lead and lifts.	Cum	358.00	
3.46	3.46.1	22 cm thick dry stone pitching (without quarry spalls) with individual stone of 22 cm depth and minimum size 0.014 cum and all other ancillary operations complete including all lead and lifts.	Cum	1833.00	
	3.46.2	30 cm thick dry stone pitching (without quarry-spalls) with individual stones of 30 cm depth and minimum size 0.021cum and all other ancillary operations complete including all lead and lifts.	Cum	1938.00	
	3.46.3	45 cm thick dry stone pitching (without quarry-spalls) with individual stones of 45 cm depth and minimum size 0.071cum and all other ancillary operations complete including all lead and lifts.	Cum	2907.00	
3.47		22 cm thick dry picked up boulder pitching with individual boulders of 22 cm depth and at least the dimension of boulders in any direction should not be less than 10 cm and all other ancillary operations complete including all lead and lifts.	Cum	648.00	
3.48		Providing stone chips under stone pitching and all other ancillary operations complete including all lead and lifts.	Cum	739.00	
3.49		Providing picked up boulder spalls under pitching and all other ancillary operations complete including all lead and lifts.	Cum	556.00	
3.50		Providing and constructing Dry rubble wall (toe wall) with stone of minimum size 0.021 cum at the base of stone pitching or riprap excluding excavation and all other ancillary operations complete including all lead and lifts.	Cum	1164.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.51		Providing and constructing dump riprap as per IS 8237 over 400mm thick graded filter media. backing consisting of sand, clean, hard, and graded (Metal/ shingle) aggregates laid in layers of 200 mm thick each including cost of all materials for riprap filter media., machinery, labour, laying to required slopes as per approved drawings, packing and wedging with stone chips and all other ancillary operations complete including all lead and lifts.			
	3.51.1	600 mm thick	Sqm	1094.00	
	3.51.2	750 mm thick	Sqm	1242.00	
	3.51.3	1000 mm thick	Sqm	1498.00	
3.52		Providing and constructing hand packed riprap as per IS 8237 over 300 mm thick graded filter media. backing consisting of sand, clean, hard, and 40mm graded (Metal/ shingle) aggregates laid in layers of 150 mm thick each including cost of all materials, labour, hand packing/ wedging stone chips finishing and all other ancillary operations complete including all lead and lifts.			
	3.52.1	300 mm thick	Sqm	713.00	
	3.52.2	450 mm thick	Sqm	862.00	
	3.52.3	600 mm thick	Sqm	1012.00	
3.53		Placing woven GI wire crates and packing pitching stones in them all other ancillary operations complete including all lead and lifts.	Sqm	276.00	
3.54		Preparing surface for turfing, including laying 15 cm of good soil on top in 7.5 cm layers, surface watering and light ramming and all other ancillary operations complete.	Sqm	44.00	
3.55		Turfing on prepared surface, including seed or sods all other ancillary operations complete including all lead and lifts.	Sqm	29.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.56		22 cm thick grouted stone pitching (without quarry- spalls) with individual stone of 22 cm depth and minimum size 0.014 cum in cement mortar 1:6 and all other ancillary operations complete including all lead and lifts.	Cum	2548.00	
3.57		Deduction for using shingle in place of metal			
	3.57.1	For using shingle 80 mm in place of coarse aggregate (metal) 80 mm	Cum	294.00	
	3.57.2	For using shingle 40 mm in place of coarse aggregate (metal) 40 mm	Cum	324.00	
	3.57.3	For using shingle 20 mm in place of coarse aggregate (metal) 20 mm	Cum	366.00	
	3.57.4	For using shingle 10 mm in place of coarse aggregate (metal) 10 mm	Cum	282.00	
3.58		Labour only for curing			
	3.58.1	Concrete	Cum	321.00	
	3.58.2	Masonry	Cum	161.00	
3.59		Dewatering and pumping of the working area including all connecting operation required complete all other ancillary operations complete including all lead and all lifts for cleanliness of working area by			
	3.59.1	Measured in terms of electric energy consumed	Kwh	40.00	
	3.59.2	5hp to 10 hp diesel pump	Hour	262.00	
	3.59.3	10 hp to 20 hp diesel pump	Hour	305.00	
3.60		Stacking without boxing and all other ancillary operations complete including all lead and lifts.			
	3.60.1	Puddle earth, moorum, sand or kankar	Cum	23.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
	3.60.2	Metal, Shingle, stone chips, quarry spalls or boulder	Cum	46.00	
3.61		Providing and laying in position M15 cement concrete with graded metal of maximum size 20 mm for cost in situ or pre cast concrete blocks in drainage bed, laid alternately, including formwork, vibration, tamping, finishing, curing cleaning of joints blocks size not more than 0.90 X 0.90 m and all other ancillary operations complete including all lead and lifts.	Cum	6802.00	
3.62		Providing and applying epoxy paint primer with middle coat and top coat to super structure including scaffolding etc. complete technical specification as per ASTM C 881 all materials should be tested as per specifications ASTM C 881 including suitability test of epoxy materials by the CWPRS or similar government institute on contractors own cost and all other ancillary operations complete including all lead and lifts.	Sqm	727.00	
3.63		Providing and applying epoxy mortar of resin and hardener with silica sand up to 20mm thickness of sika/ forsook/ pixilate or its equivalent including proper wire brushing etc. complete as per the direction of site in charge technical specification as per ASTM C 881. Epoxy resin bonding system (Resin and Hardener) confirming to ASTM C 881 Type IV class "C". (The Viscosity of neat epoxy resin bonding system by the test method ASTM D 1084 must be < 20 poise (2.0 Pa.s), Compressive strength by the test method ASTM D 695 must be ≥ 70 MPa, Tensile strength by the test method ASTM D 638 must be ≥ 50 MPa, and bonding strength by the test method ASTM C 882 must be ≥ 10 MPa). Including suitability test of epoxy materials by the CWPRS or similar government institute on contractors own cost and all other ancillary operations complete including all lead and lifts.	Sqm	5676.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.64		Sealing of cracks/ porous concrete with epoxy grout by injection through nipples complete in bucket teeth, glassics, spill way and where ever required complete. Technical specifications as per ASTM C 881 Epoxy resin bonding system (Resin and Hardener) confirming to ASTM C 881 Type IV class "C". (The Viscosity of neat epoxy resin bonding system by the test method ASTM D 1084 must be < 20 poise (2.0 Pa.s), Compressive strength by the test method ASTM D 695 must be ≥70 MPa, Tensile strength by the test method ASTM D 638 must be ≥ 50 MPa, and bonding strength by the test method ASTM C 882 must be ≥10 MPa). Including suitability test of epoxy materials by the CWPRS or similar government institute on contractors own cost and all other ancillary operations complete including all lead and lifts.	Kg	1996.00	
3.65		Providing and laying epoxy concrete with epoxy aggregate proportion 1:4 using epoxy fine quartz sand, coarse quartz sand and trap metal in suitable proportion by weight including weighing mixing placing inclusive of cleaning the surface by wire brush sand blasting for applying the tack coat of epoxy as directed and giving minimum 3 days compressive strength 525 kg per cm ² and maximum epoxy consumption of 214 kg per meter cube of concrete including necessary form work with all materials labours centring equipment's etc. complete as directed (scaffolding will be paid separately if required) (fine sand 660 kg per cum. coarse sand 660 kg per sq. meter trap metal 665 kilogram per sq. meter) Technical specifications as per ASTM C 881 Epoxy resin bonding system (Resin and Hardener) confirming to ASTM C 881 Type IV class "C". (The Viscosity of neat epoxy resin bonding system by the test method ASTM D 1084 must be < 20 poise (2.0 Pa.s), Compressive strength by the test method ASTM D 695 must be ≥70 MPa, Tensile strength by the test method ASTM D	Cum	171784.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		638 must be ≥ 50 MPa, and bonding strength by the test method ASTM C 882 must be ≥ 10 MPa). Including suitability test of epoxy materials by the CWPRS or similar government institute on contractors own cost and all other ancillary operations complete including all lead and lifts.			
3.66		Providing mixing and placing 50 to 100 mm. thick encasement with free flow high performance micro concrete as per technical specification. The graded aggregates less than 10mm. in size. Test of micro concrete material by the CWPRS or similar government institute on contractors own cost. The compressive strength of micro concrete in 28 days more than 50MPa and all other ancillary operations complete including all lead and lifts.	Sqm	10820.00	
3.67		Excavation for foundation in all kinds of soil including boulders up to 0.30 m diameter for dam, spillway, intake structure and other appurtenant works, puddle trench & cutoff trench and placing the excavated soil neatly in dump area or disposing off the same as directed and all other ancillary operations complete including all lead and lifts.	Cum	144.00	
3.68		Providing and constructing 150 mm dia. Hume pipe weep holes for concrete/ masonry walls including providing 20 x 20 x 20 cm size porous concrete block made of cement and 20 mm down coarse aggregate in 1:4 proportion including 10 cm thick sand backing at the junction of wall and soil back fill, cost of all materials, machinery, labour and all other ancillary operations complete including all lead and lifts.	M	659.00	
3.69		Providing and forming expansion joint for spillway bridge consisting of 75 x 75 x 6 mm angles 2 numbers provided with 25 cm long 12 mm dia. anchors fixed to both flanges at 15 cm c/c and 140 x 6 mm plate welded on top of one of the angle including cost of all materials,	M	2793.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		machinery, labour, providing and fixing 38 mm thick joint filler board matching the thickness of wearing coat, painting and all other ancillary operations complete including all lead and lifts.			
3.70		Providing 25 mm thick guniting to rock or masonry surface in cement mortar 1:3 proportion by weight including cost of all materials, machinery, labour, raking-out and cleaning joints, scaffolding wherever required and all other ancillary operations complete including all lead and lifts.	Sqm	553.00	
3.71		Providing and constructing contraction joints by fixing 16 SWG 60 cm wide annealed copper sheets in two lines with 8 mm dia. steel dowel rods on either side at one metre interval, forming 125 x 125 mm size groove in between copper strips for filling asphalt including fixing 15 mm dia. two legged GI pipe with U - bend at bottom for circulation of steam at intervals and forming 150 mm dia. formed drain behind water seals including cost of all materials, machinery, labour, filling asphalt, circulation of steam through pipes and all other ancillary operations complete including all lead and lifts.	Rm	26421.00	
3.72		Providing and constructing contraction joints by fixing 310 mm wide central bulb type approved quality PVC water stop in two lines with 8 mm diameter steel dowel rods on either side at 1m interval, forming 125 x 125 mm size groove in between two water stops, providing & fixing 15 mm dia. two legged GI pipe with U-bend at bottom for circulation steam at interval, forming 150 mm diameter formed drain behind water seals including filling groove with asphalt, circulation of steam at intervals, cost of all materials, machinery, labour and all other ancillary operations complete including all leads and lifts.	Rm	3057.00	
3.73		Providing and constructing contraction joints by fixing 16 SWG 60 cm wide annealed copper sheets in single line with 8 mm dia. steel dowel	Rm	12472.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		rods on either side at 1 metre interval including cost of all materials, machinery, labour and all other ancillary operations complete including all leads and lifts.			
3.74		Providing cut-off trench filling using selected impervious soil from approved borrow areas in layers of 25 to 30 cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transportation, spreading soil to specified thickness, breaking clods, sectioning, watering, compacting to density control of not less than 95 percent using Sheep foot roller/ Vibratory roller/ 8 to 10 tonne power roller as stipulated and all other ancillary operations complete including all lead and lifts.	Cum	159.00	
3.75		Providing impervious hearting embankment with selected soil from approved borrow areas in layers of 25 cm before compaction including cost of all materials, machinery, labour and all operations such as excavation, sorting out, transporting, spreading in layer of specified thickness, breaking clods, sectioning, watering, compacting Each layer to density control of not less than 95 percent or as stipulated by Sheep foot roller / Vibratory roller/ 8 to 10 tonne power roller and all other ancillary operations complete including all lead and lifts.	Cum	201.00	
3.76		Providing semi-pervious / pervious casing embankment using soil from approved borrow area in layers of 25cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transporting, spreading in layer of specified thickness, breaking clods, sectioning, watering, compacting to density control of not less than 95 percent or as stipulated by Sheep foot roller / Vibratory roller/ 8 to 10 tonne power roller all other ancillary operations complete including all lead and lifts.	Cum	204.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.77		Providing hearting / casing embankment with homogeneous soil from approved borrow areas in layers of 25 cm before compaction including cost of all materials, machinery, areas in layers of 25 cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transporting, spreading in layer of specified thickness, breaking clods, sectioning, watering, compacting each layer to density control of not less than 95 percent or as stipulated by Sheep foot roller / Vibratory roller/ 8 to 10 tonne power roller all other ancillary operations complete including all lead and lifts.	Cum	173.00	
3.78		Providing and constructing graded filter media. below and behind rock-toe consisting of 20 cm thick sand, 25 cm thick 20 - 4.75 mm and 40 cm thick 80 - 20 mm size graded coarse aggregates satisfying filter criteria as per specifications including cost of all materials, labour, machinery, laying to required slope, compaction and all other ancillary operations complete including all lead and lifts.	Cum	1297.00	
3.79		Providing and constructing graded filter media. below and behind rock-toe consisting of 30 cm thick 80 - 20 mm size graded coarse aggregates satisfying filter criteria as per specifications including cost of all materials, labour, machinery, laying to required slope, compaction and all other ancillary operations complete including all lead and lifts.	Cum	1256.00	
3.80		Providing and laying filter media. consisting of 2 layers of 250 gsm poly-propylene non-woven filter fabric and 400 mm thick 20 mm downgraded coarse aggregate for vertical/ inclined and horizontal filter blanket for embankment including cost of all materials, machinery, labour and all other ancillary operations complete including all lead for aggregate and all leads for fabric and all lifts.	Sqm	1181.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
3.81		Providing and constructing 45 cm thick chimney filter using clean approved sand satisfying filter criteria including cost of all materials, machinery, labour, compacting and all other ancillary operations complete including all lead and lifts.	Cum	1107.00	
3.82		Providing and laying Hariyala or other approved quality turfing sods for the slopes of earthen embankments over 20 mm thick sand backing including cost of all materials, machinery, labour including preparing surface, spreading sand, watering for 15 days and all other ancillary operations complete including all lead and lifts.	Sqm	131.00	
3.83		Providing, installing & erecting incorrect line and level, fiber glass reinforced plastics (FRP) " V notch" of following sizes and discharge capacities, for accurate measurement of water flowing through open channel with prefabricated fiber glass lining moulded engraved gauge marking (in lit/sec and in cms) including discharge table, capacity marking, flow direction, sand treatment on the back side of "V" notch, testing, etc. Complete as directed Engineer in charge.			
	a	FRP V notch having discharge capacity 15 lit/ sec of section 20 x 40 cms with upstream and downstream channel	No.	14093.00	
	b	FRP V notch having discharge capacity 30 lit/ sec of section 25 x 50 cms with upstream and downstream channel	No.	21737.00	
	c	FRP V notch having discharge capacity 45 lit/ sec of section 28 x 56 cms with upstream and downstream channel	No.	24775.00	
	d	FRP V notch having discharge capacity 60 lit/ sec of section 30 x 60 cms with upstream and downstream channel	No.	29626.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
	e	FRP V notch having discharge capacity 90 lit/sec of section 35 x 70 cms with upstream and downstream channel	No.	38185.00	
	f	FRP V notch having discharge capacity 120 lit/sec of section 42 x 84 cms with upstream and downstream channel	No.	47514.00	

CHAPTER-4

CANAL AND ALLIED WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to this chapter to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour.
 - b) Running charges of machinery including fuel and lubricants.
 - c) All materials required for execution of item of work.
 - d) All lead and lift of materials, machines and labours.
 - e) Wastage of Cement, Sand, Coarse Aggregate, Admixture, Concrete and Mortar.
 - f) Shuttering, Scaffolding, Formwork, Vibration, and Curing.
 - g) Testing of materials and quality assurance measures including Mix Design.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items of concrete works are inclusive of loading and unloading, standard finish and preparation of cold and hot joints.
4. All the construction materials, workmanship and quality shall conform to the standards prescribed in IS Codes and Specifications/Guidelines/Circulars of CG Water Resources Department.
5. For all nominal mixes, mix proportions shall be as per IS 456 (Reaffirmed 2011).
6. The precast slabs shall be cast at suitable centralized places using table/suitable vibrator and ensuring quality control of concrete and proper curing arrangement.
7. Provision of design mix concrete M 15, MSA 20 mm for cast in situ cement concrete lining shall be done for canals discharge up to 0.3 cumec or less or depth of water up to 0.50 m, whichever is less.
8.
 - a) Provision of design mix concrete M 15, MSA 20 mm for cast-in-situ cement concrete lining shall be done for canals having discharge more than 0.3 cumec and depth of water more than 0.50 m, whichever is less. For canals having discharge greater than 50 cumec and where thickness of lining is 100 mm or more, the maximum size of aggregate should be about 25% of thickness of lining and accordingly suitable mix design and rate analysis should be done.
 - b) Provision of Design Mix Concrete M 15, MSA 20 mm for cast-in-situ cement concrete lining in side slopes of canal with manual paver/ winch operated slip form shall be done for canals having discharge less than 5 cumec and width of canal bed shall be less than 1 m.
9. The PVC strip is to be provided as per guidelines for cast in situ cement concrete lining work in canal as per revised TC 60.

10. Flag stone lining/stone pitched lining may be done on canals carrying discharge below 3 cumec if economically feasible.
11. In item no. 4.25, the GST has been deleted from the language as well as rate of the item. Applicable GST on total amount of civil contract shall be added on the base amount worked out as per SOR 2025.
12. In Item no. 4.27 (Double Layer Cementitious Concrete Geosynthetic Mattresses) CCGM with intermittent filter points in both direction (longitudinal and vertical) is used to release the pore water pressure made up of polyester (PET) of mass 380 g/m² and tensile strength of greater than or equal to 50 KN/m².
13. For Item no. 4.28, 4.29 and 4.30 follow CPHEEO manual, CWC guidelines and IS 6530:1972 for laying at site. These pipes shall be used in the case of small cross drainage works and for CADA (Command Area Development Authority) works as per the directions of Engineer-in- Charge.
14. **Measurements:** No deduction shall be made for the following:
 - a) Volume occupied by reinforcement.
 - b) Opening up to 0.1 sqm in area.
 - c) Ends of dissimilar material for example beams, posts, girders, rafters, per lines, trusses, corbels and steps up to 0.5 sqm in cross section.
 - d) Opening up to 0.1 sqm in area (in calculating area of an opening, the thickness of separate lintel or sill shall be included in height.).
 - e) Volume occupied by pipes, conduits sheathing, etc., not exceeding 0.1 sqm each in cross sectional area.
 - f) Moulds drip moulding, chamfers, splayed rounded or curved angles, bed grooves and rebates up to 10cm in width or 15cm in girth.
15. The LDPE film, sealing compound and primer shall bear ISI Mark in accordance with Indian Standards Institution (Certification Marks) Act 1952.
16. Canal bed grade stone as per **ANNEXURE -X Type Design-5.**
17. The following Indian Standards may be referred to:

IS Code No.	Title
651:1980	Glazed stoneware pipes and fittings specification.
1398:1982	Packing Paper, Water Proof, Bitumen Laminated (First Revision) (with Amendments 1 to 3) (Reaffirmed 1994).
2505:1992	Concrete vibrators-immersion type- general requirements. (Reaffirmed 2004)
2506:1985	Screed Board Vibrators (Reaffirmed 2005)

2508:1984	Low Density Polyethylene Films (Second Revision) (Reaffirmed 2003)
2514:1963	Concrete Vibrating Tables. (Reaffirmed 2001)
3384:1986	Specification for bitumen primer for use in waterproofing and damp-proofing. (Reaffirmed 2000)
3872:2002	Lining of canals with burnt clay tiles – code of practice (Reaffirmed 2012)
3873:1993	Code of Practice for Laying In-Situ Cement Concrete Lining on Canals (Second Revision) (Reaffirmed 2004)
4031:1991	Methods for Physical Tests for Hydraulic Cement (First Revision) (Reaffirmed 2005) (Part I To XV)
4515:2002	Stone pitched lining for canals- code of practice. (Reaffirmed 2012)
4558:1995	Code of Practice for Under-Drainage of Lined Canals. (Reaffirmed 2006)
4575:1983	Code of Practice for Designs of Cross- Section of Lined Canals (With Amendments 1&2). (Reaffirmed 2005)
4701:1982	Code of practice for earthwork on canals. (Reaffirmed 2004)
4926:2003	Ready- mixed concrete- code of practice
5256:1992	Code of Practice for Sealing Joints in Concrete Lining on Canals. (Reaffirmed2003)
5690:1982	Guide for Laying Combination Lining for Existing Unlined Canals (with Amendment No.1). (Reaffirmed2004)
5889:1994	Vibratory Plate Compactor (with Amendment No.1) (Reaffirmed 2005)
7245:1974	Specification for Concrete Pavers (Reaffirmed 2001).
7246:1974	Recommendations for Use of Table Vibrators for Consolidating Concrete. (Reaffirmed 2004)
9013:1978	Methods for Making, Curing & Determining Compressive Strength of Accelerated Cured Concrete Test Specimens. (Reaffirmed 2004)
9451:1994	Guide Lines for Lining of Canals in Expansive Soils. (Reaffirmed 2004)
9698:1995	Code of Practice for Lining of Canals with Low Density Polyethylene Film. (Reaffirmed 2001)
10430:2000	Criteria for Design of Lined Canals and Guidance for Selection of Type of Lining (Reaffirmed 2004)
10646:1991	Method of Test for Determining Flexural Strength of Pre-Cast Cement Concrete Slabs for Canal Lining (Reaffirmed2004)
11809:1994	Lining for canals by stone masonry-code of practice. (Reaffirmed 2004)
12379:1988	Code of Practice for Lining in Water Courses and Field Channels. (Reaffirmed2003)

13143:1991	Specification on Joints in Concrete Lining of Canals- Sealing Compound. (Reaffirmed 2004)
15351:2003	Pneumatic fluid power- identification of ports and control mechanisms of control valves and other components.
CWC Report June 1987	Lining of canals in Expansive Soils.
T.C. 17	Canals in expansive soils-identification and treatment.
T.C. 1/84	Concrete lining.
T.C. 20	Necessity and type of Drainage Arrangements behind lining.
CSMRS Report	Report of CSMRS on ``Guideline for use of CNS soils” issued vide No. 8120/R-1/86-CSM/356 dated 18-8-87.

CHAPTER - 4
CANAL AND ALLIED WORKS
Schedule of Rates

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
		CANAL LINING WORKS			
4.01		Excavation in different types of soil in canal bed and sides slopes for lining, sleepers, steps, coping and under drainage arrangement including dressing to the profile and disposal of excavated materials and all other ancillary operations including all lead and lifts etc., complete.			
	4.01.01	In all kind of soft/loose/hard/dense soils, moorum & moorum mixed with boulders and Mud	Cum	176.00	
	4.01.02	In soft/ disintegrated/ weathered rock including wet excavation.	Cum	409.00	
	4.01.03	In hard rock of all toughness requiring blasting	Cum	1298.00	
4.02		Providing and fixing fine chisel dressed canal bed grade stone (Type design 5) embedding 45 cm deep of stone with 15 cm concrete all around and at bottom in cement concrete M15 (Design Mix), grade including excavation (all type of soil) orientation of stone along centre line and top of concrete is flushed with design bed level, curing and all other ancillary operations complete including all lead and lifts.			
		Using graded aggregate of maximum size 40 Mm			
	4.02.01	(a) Size 60 x15 x 15 cm	Each	480.00	
	4.02.02	(b) Size 55 x 15 x15 cm	Each	440.00	
	4.02.03	(c) Size 50 x 15 x15 cm	Each	400.00	
4.03		Providing and placing approved cohesive non-swelling soils, below lining in canal bed and side slopes including serration in soil, breaking of clods, laying in layers of 15 cm thickness, cutting and finishing in required bed grade & side slopes including dressing, watering, compaction (at optimum moisture content to obtained dry density not below 90%) and all other ancillary operations including all lead and lifts etc., complete.	Cum	557.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
4.04		Tamping in canal bed and sides including saturation up to 30 cm depth for preparation of earthen sub-grade before laying in-situ cement concrete lining including all lead and lifts etc., complete.	Sqm	21.00	
4.05		Providing and laying free draining sand below lining in canal bed and sides slopes including compaction cost of all materials, labour, spreading to specified thickness and all other ancillary operations complete as per specification including all lead and lifts.	Cum	1083.00	
4.06		Providing and fixing in position LDPE film of 150 micron (0.15 mm) IS mark of grade 231 for bed and sides of canal including cost of all materials, labour, laying, joining as per specifications and all other ancillary operations including all lead and lifts etc., complete.	Sqm	51.00	
4.07		Providing and applying primer, conforming IS 3384, on sleepers of in-situ cement concrete lining panels in canal as per IS 3873 and IS 5256 with layer @ 1 lit per 2 Sqm including cost of all materials, labour, as per specifications and all other ancillary operations including all lead and lifts etc., complete.			
	4.07.1	On top of sleepers	Sqm	67.00	
	4.07.2	On vertical face of panel	Sqm	34.00	
4.08		Providing and placing in position cement concrete with graded aggregate in canals, including cost of all material, vibration, finishing, curing for 28 days, cleaning and all other ancillary operations including all lead and lifts etc., complete.			
	4.08.01	For sleeper and safety ladders using graded aggregate of maximum size 20 mm with,			
		Cement concrete M15 (Design mix)	Cum	5160.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.08.02	For in-situ lining in canal (in bed, slopes and coping) with design mix Concrete.			
		M15, 20 mm graded aggregate	Cum	5317.00	
4.09		Providing and placing in position M15 Grade Design Mix Concrete using graded aggregate of maximum size 20 mm. for in-situ lining in canal bed and side slopes including form work for laying in panels, screeding the surface of side slopes with manual paver/winch operated slip form, vibration, making grooves as per IS 3873, curing for 28 days by constructing brick masonry drains with weep holes of perforated pipes on the coping at the top of lining or by sprinklers cleaning and all other ancillary operations complete including cost of all materials including all lead and lifts.	Cum	5728.00	
4.10		Filling contraction joints (grooves) as per IS 5256 with hot applied sealing compound IS 13143 including cleaning and washing grooves, painting its inner surfaces with primer IS 3384 at the rate of 1 litre per 4 Sqm inclusive of cost of all materials for in-situ concrete lining and all other ancillary operations including all lead and lifts etc., complete.			
	4.10.1	grooves of 17 mm depth	M	34.00	
	4.10.2	grooves of 20 mm depth	M	40.00	
	4.10.3	grooves of 27 mm depth	M	54.00	
	4.10.4	grooves of 30 mm depth	M	60.00	
	4.10.5	grooves of 33 mm depth	M	66.00	
4.11	4.11.1	Providing and placing in position M15 Grade Design Mix Concrete having air entraining agent by paver machine in bed, side slopes and curvature including cost of all material trimming, batching, mixing, transporting, placing, vibrating, inserting PVC strips at joints, smooth finishing, curing and all other ancillary operations complete including all lead and lifts.	Cum	5279.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
		Using graded aggregate of maximum size 20 mm			
	4.11.2	Providing PVC Strip for Paver lining	M	200.00	
4.12		Providing & fixing in position Precast Cement Concrete slabs of M15 grade design mix concrete of various sizes in CM 1:3 proportion by volume for lining of canal over 12 mm thick bed of CM 1:3 including cost of all materials, labour, preparing surface, packing mortar into joints and flush pointing in CM 1:3 joints neatly, curing and all other ancillary operations complete including all lead and lifts.			
		Using graded aggregate of maximum size 20 mm			
	4.12.1	Pre cast Slab of 60 mm thickness	Sqm	447.00	
	4.12.2	Pre cast Slab of 50 mm thickness	Sqm	403.00	
	4.12.3	Pre cast Slab of 40 mm thickness	Sqm	392.00	
4.13		Providing and laying stone slab lining for canals on average 12 mm thick bedding of cement mortar 1:3 with raking, refilling and pointing in cement mortar 1:3 striking joints, curing and cleaning and all other ancillary operations complete including cutting slab to required size and cost of all materials 40 to 50 mm thick flag stone including all lead and lifts.	Sqm	488.00	
4.14		Providing and constructing stone pitched lined canal in compartment made of stone masonry in cement mortar 1:3 with pin headers at every 2 sqm using stones and stone chips from approved source including cost of all materials, labour, hand packing/wedging stone chips, finishing and all other ancillary operations including all lead and lifts etc., complete.			
	4.14.1	150 mm thickness	Sqm	245.00	
	4.14.2	225 mm thickness	Sqm	303.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.14.3	300 mm thickness	Sqm	462.00	
4.15		Providing and constructing stone masonry in CM 1:3 with pointing in similar mortar proportion by volume for canal lining over a bed of minimum 12 mm thick similar cement mortar using stones from approved quarry including cost of all materials, machinery, labour, batching and mixing mortar, raking & pointing, mortar joints, finishing, curing and all other ancillary operations including all lead and lifts etc., complete.	Cum	3338.00	
4.16		Providing and laying of 150 mm dia. PVC corrugated perforated pipes in longitudinal & transverse drains including joints and all other ancillary operations complete as per specifications including all lead and lifts.	M	277.00	
4.17		Providing and forming 610x610x975 mm deep filter drain pocket around pressure relief pipe consisting of 75 mm thick, each layer with 20 - 40 mm graded gravel layer & 5-20 mm graded gravel and sand layer including cost of all materials, labour and all other ancillary operations including all lead and lifts etc., complete.	Each	458.00	
4.18		Providing and constructing of longitudinal & transverse graded filter drains around of 150 mm perforated PVC pressure release pipe having gradually decreasing thickness layer using 40 mm graded metal 150 mm thickness and 75 mm thick layer of coarse sand of minimum FM 1.5 approved clean, hard, gravels satisfying specified filter criteria in layers of specified thickness including cost of all materials, labour, laying to required slopes compaction and all other ancillary operations complete as per specification and approved drawings including all lead and lifts. Note: - Excavation shall be paid separately as per excavation rate given in chapter 02.			
	4.18.1	Sand	Cum	1710.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.18.2	Metal 40 mm Graded Metal	Cum	1333.00	
	4.18.3	150 mm perforated PVC pressure release pipe	M	264.00	
4.19		Providing and laying bitumen laminated water proof paper IS 1398(Type 1) over top of drains and sand surface before laying in-situ cement concrete lining including all lead and lifts.	Sqm	28.00	
4.20		Providing and fixing flap valves in drains including all lead and lifts.	Each	701.00	
4.21		Providing and fixing in position pressure relief valves of size 150 mm IS 4985 for outlets in longitudinal drains in canal bed as per specifications including of cost of all materials including all lead and lifts.	Each	1039.00	
4.22		Providing and fixing in position R.C.C cylindrical boxes and covers at outlet in longitudinal drains IS 4558 pre-cast cement concrete M15 Design mix with 12.5 mm graded aggregate excluding cost of reinforcement but including form work, vibration, finishing, curing and all other ancillary operations including all lead and lifts etc., complete.	Cum	7167.00	
4.23		Construction of Dowels (Dowlas)			
	4.23.1	Construction of Dowels, 30 cm wide on top and 30 cm in height (1.5:1 side slopes) on the canal banks including excavation, dressing and all other ancillary operations including all lead and lifts etc., complete.	M	51.00	
	4.23.2	Construction of Dowels, 30 cm wide on top and 30 cm in height (2:1 side slopes) on the canal banks including excavation, dressing and all other ancillary operations including all lead and lifts etc., complete.	M	61.00	
4.24		Extra rate for Item No. 4.08.2.2, 4.08.2.3, 4.09, 4.11.1.1 and 4.11.1.2 for providing and mixing fibrillated polypropylene fibers 6 mm to 25 mm length conforming to IS 16481: 2016, to be added @ 0.91 kg/cum to concrete used for lining of canals carrying discharge more than 1 cumecs.	Cum	340.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
4.25		Bituminous Geomembrane liner for canal: Supply, laying and joining Bituminous Geomembrane as hydraulic liner over canal with side slope not steeper than 1(V):1(H) including up to 200 mm overlap, having average thickness of 4mm (minimum thickness 3.6mm), minimum width of 5m, minimum tensile strength of 15kN/m and minimum permissible elongation of 50% which shall be laid on the properly prepared subgrade including import duties & custom clearance charges, transportation, loading/unloading, labour charges, excavation for trench, anchorage and testing which shall confirm to ASTM/IS standards and excluding dismantling of concrete, earthwork, dewatering, and overlap beyond 200 mm and all other ancillary operations including all lead and lifts etc., complete.	Sqm	1782.00	
4.26		Standard CCGM: Supplying, laying and Installation of Double Layer Cementitious Concrete Geosynthetic Mattresses- Standard CCGM (of required thickness after filling) width 5 m, as Hydraulic liner over canal, or as lining on reservoirs, ponds, water storage facility or on upstream side of Earthen Embankments/ Dams etc. with capacity to withstand the high UV resistance. Including import duties and custom duties, transportation, supply at site and loading/unloading charges and 15% for shrinkage which shall confirm to standards, and including supply and laying of 150GSM Non-Woven Geotextile for separation and filtration purpose below CCGM, complete as directed by Engineer in Charge. (The rate of above item includes supply of all hardware materials, pegging, stitching/zipping & all other consumables and equipment's for laying of such material excluding cost of concrete) (Pre measurement shall be made after layout of mattress at site and actual measurement shall be taken after filling of concrete inside CCGM after that payment shall be made with allowable maximum shrinkage of 15% or as per actual whichever is less) including all lead and lifts.			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
		Thickness after filling (mm)			
	4.26.1	60	Sqm	1537.00	
	4.26.2	80	Sqm	1776.00	
	4.26.3	100	Sqm	1981.00	
4.27		CCGM with FP (filter point): Supplying, laying and Installation of Double Layer Cementitious Concrete Geosynthetic Mattresses with intermittent filter points- CCGM with intermittent FP in both direction (of required thickness after filling) width 5 m, as Hydraulic liner over canal, or as lining on reservoirs, ponds, water storage facility or on upstream side of Earthen Embankments/ Dams etc. Including import duties and custom duties, transportation, supply at site and loading/unloading charges and 15% for shrinkage which shall confirm to standards, and including supply and laying of 150GSM Non-Woven Geotextile for separation and filtration purpose below CCGM, with capacity to withstand the high UV resistance. complete as directed by Engineer in Charge. (The rate of above item includes supply of all hardware materials, pegging, stitching/zippping & all other consumables and equipment's for laying of such material excluding cost of concrete) (Pre measurement shall be made after layout of mattress at site and actual measurement shall be taken after filling of concrete inside CCGM after that payment shall be made with allowable maximum shrinkage of 15% or as per actual whichever is less) including all lead and lifts.			
		Thickness after filling (mm)			
	4.27.1	100	Sqm	2680.00	
	4.27.2	200	Sqm	3173.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
4.28		Providing, laying and jointing of Asbestos cement pressure pipe (class 15), with AC coupler joint along with EPDM rubber ring, ISI marked confirming to IS 1592 :2003 tested to the required pressure including testing of joints, cost of pipes, all complete manufactured by Mazza process including all lead and lifts.			
	4.28.1	100mm	M	409.00	
	4.28.2	125mm	M	527.00	
	4.28.3	150mm	M	638.00	
	4.28.4	200mm	M	1083.00	
	4.28.5	250mm	M	1445.00	
	4.28.6	300mm	M	2001.00	
	4.28.7	350mm	M	2580.00	
4.29		Providing, laying and jointing of Asbestos cement pressure pipe (class 20), with AC coupler joint along with EPDM rubber ring, ISI marked confirming to IS 1592: 2003 tested to the required pressure including testing of joints, cost of pipes, all complete manufactured by Mazza process including all lead and lifts.			
	4.29.1	100mm	M	505.00	
	4.29.2	125mm	M	642.00	
	4.29.3	150mm	M	786.00	
	4.29.4	200mm	M	1376.00	
	4.29.5	250mm	M	1834.00	
	4.29.6	300mm	M	2568.00	
	4.29.7	350mm	M	3318.00	
4.30		Providing, laying and jointing of Asbestos cement pressure pipe (class 25), with AC coupler joint along with EPDM rubber ring, ISI marked confirming to IS 1592: 2003 tested to the required pressure including testing of joints, cost of pipes, all complete manufactured by Mazza process including all lead and lifts.			
	4.30.1	100mm	M	614.00	
	4.30.2	125mm	M	798.00	
	4.30.3	150mm	M	983.00	
	4.30.4	200mm	M	1702.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.30.5	250mm	M	2268.00	
	4.30.6	300mm	M	3242.00	
	4.30.7	350mm	M	4130.00	
4.31		Fixing in position NP1 & NP2 half round Hume pipes for canal lining (for water courses & field channels) including handling toeing, filling the joints with filler materials and cement mortar 1:3 curing and all other ancillary operations complete (excluding cost of pipes collars) including all lead and lifts.			
	4.31.1	(a) 80 mm dia. (NP1)	M	92.00	
	4.31.2	(b) 100 mm dia. (NP1)	M	96.00	
	4.31.3	(c) 150 mm dia. (NP1)	M	96.00	
	4.31.4	(d) 250 mm dia. (NP1)	M	99.00	
	4.31.5	(e) 300 mm dia. (NP1)	M	131.00	
	4.31.6	(f) 350 mm dia. (NP1)	M	165.00	
	4.31.7	(g) 400 mm dia. (NP1)	M	197.00	
	4.31.8	(h) 450 mm dia. (NP1)	M	230.00	
	4.31.9	(i) 500 mm dia. (NP2)	M	264.00	
	4.31.10	(j) 600 mm dia. (NP2)	M	329.00	
		EMBANKMENT WORKS FOR CANAL (DAM SPECIFICATION)			
4.32	4.32.01	Providing hearting/casing embankment with homogeneous soil from approved borrow areas in layers of 25 cm before compaction including cost of all materials, machinery, labour, all operations such as excavation, sorting out, transporting, spreading in layer of specified thickness, breaking clods, sectioning, watering, compacting each layer to density control of not less than 95 percent or as stipulated by Sheep foot roller/Vibratory roller/ 8 to 10 tonne power roller and all other ancillary operations including all lead and lifts etc., complete.	Cum	173.00	
		FOUNDATION FILLING WORK			
4.33	4.33.01	Providing rubble and sand filling in layers of 22.5 to 30 cm including cost of all materials, machinery, labour, watering, ramming and all other ancillary operations including all lead and lifts etc., complete.	Cum	1151.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.33.02	Providing rubble and Moorum filling in layers of 22.5 to 30 cm including cost of all materials, machinery, labour, watering, ramming and all other ancillary operations including all lead and lifts etc., complete.	Cum	831.00	
	4.33.03	Providing and laying sand blanket below embankment including cost of all materials, machinery, labour, spreading to specified thickness and all other ancillary operations including all lead and lifts etc., complete.	Cum	619.00	
	4.33.04	Providing and constructing dry rubble rock- toe using rubble and stone chips from approved source including cost of all materials, machinery, labour, hand packing rubble and stone chips, finishing top and sides to required slopes and all other ancillary operations including all lead and lifts etc., complete.	Cum	1014.00	
	4.33.05	Providing and constructing longitudinal and cross graded filter drains using sand and 20 mm downgraded aggregates satisfying specified filter criteria in layers as per specifications including cost of all materials, machinery, labour, laying to required slopes, compaction and all other ancillary operations including all lead and lifts etc., complete.	Cum	1181.00	
	4.33.06	laying Longitudinal Drains and Transverse drains of Size 600 x600 x750 mm in bed and filling with 12 mm to 40 mm HG machine crushed metal and sand in bed including excavation of drains and cost of procuring of all materials including all lead and lifts.	Rm	554.00	
	4.33.07	laying and fixing of 100 mm Dia. 300 mm long precast Porous CC plugs in bed and sides using 0.787 Kgs of cement per each using 20 mm HG metal and placing in local filters of size 600 x600 x750 mm in size including excavation of drains and cost of procuring of all materials including all lead and lifts.	One plug	462.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	
	4.33.08	Providing and constructing graded filter media. below and behind rock-toe consisting of 20 cm thick sand, 15 cm thick 20 mm down and 15 cm thick 40 mm down size graded coarse aggregates satisfying filter laying to required slope, compaction and all other ancillary operations complete with initial lead up to 50 m and all lifts criteria behind rock-toe and 15 cm thick sand, 20 cm thick 20 mm down coarse aggregate and 65 cm thick 40 mm down size coarse aggregate satisfying filter criteria below rock-toe as per specifications including cost of all materials, machinery, labour including all lead and lifts.	Cum	1323.00	
	4.33.09	Providing and laying filter media. consisting of 2 layers of poly propylene non-woven filter fabric and 200 mm thick 20 mm downgraded coarse aggregate for embankment including cost of all materials, machinery, labour, forming toe drain and all other ancillary operations complete including all lead and lifts. Using 250 gsm filter fabric	Sqm	590.00	
		ROCK AND FILL WORK			
4.34		Providing and constructing rockfill casing to canal embankment with graded stones and stones and spalls in layers, hand packing, wedging, finishing surface to required slopes and all other ancillary operations including all lead and lifts etc., complete.	Cum	952.00	
4.35		Providing compacted embankment for field irrigation channels with gravely soil from approved borrow area including sorting out, spreading in layers of 15 cm thickness, breaking clods, watering, compacting, dressing sides to required slopes and all other ancillary operations including all lead and lifts etc., complete.	Cum	354.00	
4.36		Providing rubble / boulder and sand filling behind abutment and return walls in layers including cost of all materials, machinery, labour, watering, ramming all other ancillary operations including all lead and lifts etc., complete.	Cum	708.00	

CHAPTER-5

CANAL STRUCTURE

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour.
 - b) Running charges of machinery including fuel and lubricants.
 - c) All materials required for execution of item of work.
 - d) All leads and lift of materials, machines and labours.
 - e) Wastage of Cement, Sand, Coarse Aggregate, Admixture, Concrete, Mortar etc.
 - f) Shuttering, Scaffolding, Formwork, Vibration, and Curing
 - g) Testing of materials and quality assurance measures, including Mix Design.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items of concrete works are inclusive of loading and unloading, standard finish required for concrete work, cleaning/preparation of cold and hot joint.
4. All the construction materials, workmanship and quality shall conform to the standards prescribed in IS Codes and Specifications/Guidelines/Circulars of CG Water Resources Department.
5. For all nominal mixes, mix proportions shall be as per IS 456:2000(Reaffirmed 2011).
6. For purpose of measurement of concrete/masonry work in piers and retaining walls in canal structures and similar work the following shall be applied:
 - a) **Foundation and Sub structure:** work up to 1.5 m above top of foundation concrete.
 - b) **Super structure:** for all works above the level specified in 6 (a).
7. In case of canal structures with well sinking or pile foundations the following definitions shall be applied:
 - a) **Foundation:** All works below ground level or below water level, whichever is higher, but not above soffit level of deck slab/ beam shall be termed as foundation.
 - b) **Sub structure:** The part of the bridge (or canal structure) below soffit level of the deck slab/beam but above the foundation level as defined in (a) above, shall be taken as sub-structure of the bridge (or canal structure) part.
 - c) **Super structure:** The work above soffit level for deck slabs/beams including centering and shuttering (formwork) required for the superstructure, kerbs, railings, expansion joints, beams, slabs, etc., shall be termed as superstructure of the bridge (or canal structure) part.
8. The bearings shall conform to section no.2000 of "Specifications for Road and Bridge Works" (First Revision) of Ministry of Shipping and Transport (Roads Wing).
9. **Measurement: Reinforced Cement Concrete**
 - a) Dimensions shall be measured to nearest 0.01 m. except for the thickness of slab

which shall be measured to nearest 0.005 m. the areas shall be worked out to nearest 0.01 sq. m. The cubical contents shall be worked out to nearest 0.01 cum.

- b) The filling in the well shall be measured on the cross-sectional area of the dredge hole multiplied by the height of the fill.
- c) Concrete in well steining shall be measured by multiplying the cross-sectional area of the steining by the height of the steining as actually casted.
- d) No deduction shall be made for the following:
 - i. Ends of dissimilar materials for example beam, posts, girders, rafters, purlins, trusses, corbels and step up to 0.5 sqm in cross section.
 - ii. Opening up to 0.1 sqm in area (in calculating area of an opening, the thickness of any separate lintel or sill shall be included in height).
 - iii. Volume occupied by reinforcement.
 - iv. Volume occupied by pipes, conduits, sheathing, etc., not exceeding 0.1 sqm each in cross sectional area.
 - v. Moulds, drip moulding, chamfers, splays, rounded or curved angles, beds, grooves and rebates up to 10 cm in width or 15 cm in girth.
 - vi. Columns shall be measured from top of column base to underside of floor slab.
 - vii. In case of columns for flat slabs, flare of column shall be included with column for measurement.
 - viii. Beams shall be measured from face to face of columns and shall include haunches, if any, between columns and beams. The depth of beams shall be measured from bottom of slab to bottom of the beam except in case of inverted beams where it shall be measured from top of slab to top of beam.

10. Measurement: Reinforcement steel

- (a) Dimensions excepting cross-sections and thickness of plate shall be measured to nearest .001m except for reinforcement which shall be measured to nearest 0.005 m.
- (b) Areas excluding cross-sectional measurements shall be worked out to nearest 0.001 sqm.
- (c) Weights shall be worked out to nearest kg.
- (d) Weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm, gussets (taking overall sq. dimensions), fish plates, etc. shall be added to the weight of respective items.
- (e) An addition of 2.5 percent of the weight of structure shall be made for shop and site rivet heads in riveted steel structures.
- (f) No deduction shall be made for rivet or bolt holes (excluding holes for anchor or holding down bolts). Deduction in case of rivet or bolt hole shall however be made if its area exceeds 0.02sqm.
- (g) The weight of steel sheet, plate and strip shall be taken from relevant Indian Standards based on 7.85 kg/sq m for every mm sheet thickness.
- (h) For forged steel and steel castings, weight shall be calculated on the basis of 7850kg per cum.
- (i) In the case of welded steel structures, no allowance shall be made for the weld metal.

- (j) Steel reinforcement shall be measured by weight in kg. and shall include cutting to lengths, hooked ends cranking or bending (straight or spiral). Authorized overlaps, chairs/separators shall be measured. Binding wire for reinforcement shall not be measured.

11. Masonry: Classification of masonry

- a) **Masonry**: For masonry works up to 15 m height:
- i. **Hammer dressed coursed rubble masonry**: Face stone shall be hammer dressed on all beds and joints, so as to give them approximately rectangular shape. The bed and side joints shall be hammer dressed for 75 mm from the face. The bushing on the face shall not be more than 4 cm on an exposed face.
 - ii. **Random rubble or uncoursed masonry**: Stones used for uncoursed or random rubble masonry work shall be hammer dressed on the sides and bed in such a way as to close up with the adjacent stone in masonry work as strongly as possible. The face of stones shall be so dressed that bushing on the exposed face shall not project by more than 4 cm from the general wall surface.
- b) **Bond stones**: Through bond stones shall be provided in walls up to 60 cm thick and in case of walls above 60 cm thickness, a set of two or more bond stones overlapping each other by at least 15 cm shall be provided in line from face to back. Each bond stone or a set of bond stones shall be provided at 1.5 m to 1.8 m apart clear in each course. The bond stones shall be staggered in successive courses and marked for identification:
- i. **Plum stones (Pin-header)**: Pin header or plum stones shall be provided in hearting at about 1.8 m interval (both across and along). They shall run through the height of at least two courses. Their position shall be staggered in successive courses.
 - ii. **Joints**: The maximum thickness of joints shall be 6 mm for various types of ashlar masonry, 10 mm for squared rubble masonry coursed (first sort), 15 mm for squared rubble masonry (second sort), 20 mm for hammer dressed coursed rubble masonry and 35 mm for random rubble uncoursed masonry.
 - iii. **Masonry**: For masonry works having height above 15 m (height means structural height above lowest foundation level and is applicable for entire length of dam and other massive structures).
 - iv. **Face masonry**: Face stones shall be hammer dressed on face and one line chisel dressed (finishing given to the stone face with no portion of it projecting more than 10 mm from the straight edge laid along the face of the stone) on bed, top and sides for 75 mm from the face batter. The bushing on the faces of the stones shall not project more than 4 cm.
 - v. **Coursed rubble masonry**: Face stones shall be hammer dressed on face, sides and bed for 75 mm with the course normal to the face batter. The bushing on the faces of the stones shall not project more than 4 cm.
 - vi. **Random rubble masonry**: The hearing is of random rubble work.

12. The rates for providing K.M. stones, 0.2 K.M. stone, chainage-cum-boundary stone of

various types include lead up to 100m for all Materials.

13. Normally before fixing of the stones (Km, 0.2 Km and bed grade) the chaining of the constructed canal shall be redone.
14. On canals the stone (K.M. and 0.2 K.M.) shall be normally fixed with the top of concrete platform at 0.1m above formation level of the canal bank with front edge of the stone at a distance of 1.5m from the outer edge of the bank at top. For this purpose, the extra depth of concrete wherever required, over and above the provisions made in completed item, shall be payable as per the rates provided in the relevant chapters.
15. **Measurements:**
 - i. Dimensions shall be measured correct to the nearest cm. The area shall be calculated in sqm correct to two places of decimal and cubical contents in cum correct to two places of decimal.
 - ii. No deduction or addition shall be made for the following:
 - a) Ends of dissimilar materials (that is joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps, etc.) up to 0.1 sqm in section.
 - b) Opening up to 0.1 sqm in area.
 - c) Cement concrete blocks for holding down bolts and the like.
 - d) Iron fixtures such as wall tie, pipes up to 300 mm dia.
16.
 - a) Where specifications of face masonry differ from those of hearting, rate of face masonry will be payable as per actual width limited up to 60 cm from the face.
 - b) Double face masonry shall be payable for actual width or up to 60cm, whichever is less, for each side.
 - c) The stones for masonry shall be hard, durable tough, sound and clean. They should be free from decay, weathered faces, soft seams, adhering coating, sand holes, veins, flaws, cracks, stains and other defects and shall have, as far as possible, uniform colour and texture. Stones not uniform in colour, texture and/or with stains may be permitted after proper tests.
 - d) **Stones:** The size of the stone shall be normally varied from 0.05 to 0.01 cum no stone larger than the maximum specified size of 0.05 cum should be used (in general). The stones shall be taken from quarries approved by the Geologist and Engineer-in-Charge. The stone shall weigh less than 25 kg used in hearting shall be roughly cubical in shape. No stones weighing between 75 kg and 150 kg shall be less than 225 mm in any direction and no stone weighing between 25 kg and 75 kg shall be less than 150 mm in any direction.
 - e) Spalls with minimum dimension of 200 mm to 100 mm shall be used to wedge in to thick mortar spaces. They shall not normally exceed 10 % of the volume of stone masonry.

17. **The following Indian Standards and Indian Road Congress publications may be referred:**

IS Codes	Title
269:2015	Ordinary Portland cement- specifications (Reaffirmed 2020)
383:2016	Coarse and Fine Aggregate for Concrete - Specification
455:2015	Portland Slag Cement – Specification (Reaffirmed 2020)
456:2000	Plain and Reinforced concrete – code of practice.
458:2003	Concrete Pipes (with or without reinforcements) (Fourth Revision) (Reaffirmed 2013)
516:1959	Methods of tests for strength of concrete (Reaffirmed 2004)
783:1985	Code of Practice for Laying of Concrete Pipes (Reaffirmed 2012)
1199:2018 part II	Fresh Concrete — Methods of Sampling, Testing and Analysis
1322:1993	Bitumen Felts for Water Proofing and Damp Proofing (Second Revision) (with Amendment Nos. 1 And 2) (Reaffirmed 2003).
1343:2012	Prestressed Concrete-code of practice. (Reaffirmed 2022)
1489:2015	Portland Pozzolana Cement-specifications
	(Reaffirmed 2020)
1791:2020	General Requirements for Batch Type Concrete Mixers
1838:1961 part II	Preformed Fillers for Expansion Joints in Concrete Non-Extruding and Resilient Type (Bitumen Impregnated Fiber). (Reaffirmed 2000)
2386:1963 part I	Method of test for aggregates for concrete part I particle size & shape.
2386:1963 part II	Method of test for aggregates for concrete part II Estimation of deleterious material & organic impurities.
2386:1963 part III	Method of test for aggregates for concrete Part III Specific gravity, density, voids, absorption, and bulking.
2386:1963 part IV	Method of test for aggregates for concrete part VI Mechanical properties.
2386:1963 part V	Method of test for aggregates for concrete part V Soundness.
2386:1963 part VI	Method of test for aggregates for concrete part VI Measuring mortar making properties of fine aggregate.
2386:1963 part VII	Method of test for aggregates for concrete part VII Alkali aggregate reactivity.

2386:1963 part VIII	Method of test for aggregates for concrete part VIII Petrographic examination.
2405:1980 part II	Specification for industrial sieve part-2 perforated plants.
2430:1986	Method for sampling of aggregates for concrete.
2505:2023	Immersion types concrete vibrators- General requirements
2506:2022	General Requirements for Concrete Vibrators, Screed Board Type
2514:2023	Concrete Vibrating Tables — Specification
2911: 1979	Code of Practice for Design and Construction of Pile Foundations
2911 (part I/ Sec.1): 2010	Concrete Piles, Section 1, Driven Cast In-Situ Concrete Piles (First Revision) (Reaffirmed 2002)
2911 (part I/Sec. 2):2010	Concrete Piles, Section 2, Bored Cast- In Situ Piles (First Revision) (Reaffirmed 2002)
2911 (part IV):2013	Load Test on Piles. (Reaffirmed 2002)
3535:1986	Methods of sampling hydraulic cement. (Reaffirmed 2004)
3812:2013	Pulverized fuel ash- specification for use as pozzolana in cement mortar and concrete.
3955:1967	Code of Practice for Design and Construction of Well Foundations (with Amendment No.1)
4031:1988 (part 1 to part 13)	Methods of physical tests for hydraulic cement.
4032:1985	Methods of chemical analysis of hydraulic cement. (Reaffirmed 2005)
4082:1996	Stacking and Storage of construction materials and components at site-recommendation. (Reaffirmed 2003)
4634:1991	Batch-type concrete mixers-method of test-performance. (Reaffirmed 2005)
4656:1968	Specification for form vibrators for concrete.
4925:2004	Concrete batching and mixing plant- Specification
5121:1969	Safety Code for Piling and other Deep Foundations (Reaffirmed 2005)
6003:2010	Indented wire for prestressed concrete -specification
6006:2014	Uncoated stress relieved strand for prestressed concrete-Specification (Reaffirmed 2019)
6426:1972	Pile Driving Hammer. (Reaffirmed 2005)
6427:1972	Glossary of terms relating to Pile Driving Equipment. (Reaffirmed 2005)

6428:1972	Pile Frame (Reaffirmed 2005)
6461:1972 (part 1 to part 7)	Glossary of terms relating to cement concrete.
6461:1972 (part 8 to part 12)	Glossary of terms relating to cement concrete.
6531:1994	Canal Head Regulators - Criteria for Design (First Revision) (Reaffirmed 2010)
6751:1972	Aluminum Alloy Casting and Strips for Bearing (Reaffirmed 1999)
6909:1990	Super sulphated cement- Specification. (Reaffirmed 2010)
6936:1992	Guide for Location, Selection and Hydraulic Design of Canal Escapes (First Revision) (Reaffirmed 2012)
7114:1973	Criteria for Hydraulic Design of Cross Regulators for Canals (Reaffirmed 2013)
7331:1981	Code of Practice for Inspection and Maintenance of Cross-Drainage Works (First Revision) (Reaffirmed 2012)
7495:1974	Criteria for Hydraulic Design of Silt Selective Head Regulator for Sediment Control in off Taking Canals (Reaffirmed 2013)
7623:2019	Multipurpose Industrial Grease- Specification.
7784(Part 1):2013	Design of Cross Drainage Works - Code of Practice: Part 1 General Features (First Revision)
7784(Part 2/Sec 1):1995	Design of Cross Drainage Works - Code of Practice: Part 2 Specific Requirement Section 1- Aqueducts (Reaffirmed 2010)
7784(Part 2/Sec 2):2000	Code of Practice for Design of Cross Drainage Works: Part 2 Specific Requirement Section 2 - Super Passages (First Revision) (Reaffirmed 2013)
7784(Part 2/Sec 3):1996	Code of Practice for Design of Cross Drainage Works -: Part 2 Specific Requirement Section 3 -Canal Syphon (First Revision) (Reaffirmed 2011)
7784(Part 2/Sec 4):1999	Design of Cross Drainage Works - Code of Practice Part 2 Specific Requirement Section 4-Level Crossings (First Revision) (Reaffirmed 2013)
7784(Part 2/Sec 5):2000	Code of Practice for Design of Cross Drainage Works: Part 2 Specific Requirement Section 5- Syphon Aqueducts (First Revision) (Reaffirmed 2013)
7861(part 1):1975	Code of practice for extreme weather concreting part 1 hot weather.
7871:1975	Criteria for Hydraulic Design of Groyne Walls (Curved Wing) for Sediment Distribution at off take points in a Canal (Reaffirmed 2013)
7880:1975	Criteria for Hydraulic Design of Skimming Platform for Sediment Control in off taking Canal (Reaffirmed 2013)

7986:1976	Code of Practice for Canal Outlets (Reaffirmed 2013)
8041:1990	Rapid hardening Portland cement- Specification
8112:2013	Ordinary Portland cement, 43 Grade-Specification
9103:1999	Concrete admixture-specification. (Reaffirmed 2004)
9913:2000	Code of Practice for Construction of Cross Drainage Works (First Revision) (Reaffirmed 2013)
IRC: 5	Code of Practice for Road Bridges Part-1
IRC 6	Code of Practice for Road Bridgespart-2 Loads and Stresses
IRC 18	Code of Practice for Pre-Stressed Concrete Road Bridges
IRC 21:2000	Standard Specification and Code of Practice for Road Bridges (Section-(iii) Cement Concrete (Plain and Reinforced). (Third Revision)
IRC 43	Recommended Practice for Tools, Equipment and Appliances for Concrete Pavement Construction
IRC 45:1972	Recommendations for Estimating the Resistance of Soil below the Maximum Scour Level in the Design of Well Foundation of Bridges.
IRC 78	Standard Specification and Code of Practice for Road Bridges, Section VII Foundation and Substructures
IRC 83	Standard Specification and Code of Practice for Road Bridges
SP 23	Hand Book on Concrete Mixes
SP 24	Explanatory hand book on Indian Standard code for plain & reinforced concrete (IS 456-2000)

CHAPTER – 5
CANAL STRUCTURES
Schedule of Rates

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
5.01		Providing and fixing 25 mm dia. 2.50 m long cold twisted deformed steel dowel/ anchor bar with 1.25 m length driven into 38 mm dia. Hole drilled in bed rock and remaining length embedded in concrete/ masonry including cost of all materials, machinery, labour, drilling, cleaning hole, filling hole with thick cement slurry, driving anchor rod and all other ancillary operations complete including all lead and lifts.	Each	1610.00	
5.02		Providing and laying M15 grade Plain Cement Concrete Design Mix graded aggregate clean, hard for foundation filling and substructure including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.02.1	150 mm	Cum	5414.00	
	5.02.2	80 mm	Cum	5437.00	
	5.02.3	40 mm	Cum	5512.00	
	5.02.4	20 mm	Cum	5544.00	
5.03		Providing and laying M20 grade Plain Cement Concrete Design Mix graded aggregate clean, hard for foundation filling and substructure including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.03.1	80 mm	Cum	6122.00	
	5.03.2	40 mm	Cum	6152.00	
	5.03.3	20 mm	Cum	6202.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
5.04		Providing and laying M20 grade Reinforced Cement Concrete Design Mix using graded aggregates clean, hard for foundation filling and substructure including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) machinery, labour, formwork, cleaning, batching, mixing, placing in position levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.04.1	40 mm	Cum	6332.00	
	5.04.2	20 mm	Cum	6382.00	
5.05		Providing and laying M25 grade Plain Cement Concrete Design Mix for filling foundation & substructure using graded aggregates clean, hard including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed, levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.05.1	40 mm	Cum	6454.00	
	5.05.2	20 mm	Cum	6829.00	
5.06		Providing and laying M25 grade Reinforced Cement Concrete Design Mix for filling foundation & substructure using graded aggregates clean, hard including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed, levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
	5.06.1	40 mm	Cum	6638.00	
	5.06.2	20 mm	Cum	7013.00	
5.07		Providing and laying M15 grade Plain Cement Concrete Design Mix using graded aggregate clean, hard for superstructure including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.07.1	80 mm	Cum	5445.00	
	5.07.2	40 mm	Cum	5995.00	
	5.07.3	20 mm	Cum	6170.00	
5.08		Providing and laying M20 grade Plain Cement Concrete Design Mix using graded aggregate clean, hard for superstructure including cost of all materials, machinery, labour, formwork, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.08.1	80 mm	Cum	5988.00	
	5.08.2	40 mm	Cum	6185.00	
	5.08.3	20 mm	Cum	6351.00	
5.09		Providing and laying M20 grade Reinforced Cement Concrete Design Mix using graded aggregate clean, hard for superstructure including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) machinery, labour, formwork, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.09.1	40 mm	Cum	6984.00	
	5.09.2	20 mm	Cum	7150.00	
5.10		Providing and laying M25 grade Plain Cement Concrete Design Mix for superstructure			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		using graded aggregates, clean, hard including cost of all materials, machinery, labour, formwork, cleaning, batching, mixing, placing in position as directed, levelling, compacting, vibrating, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.10.1	40 mm	Cum	7187.00	
	5.10.2	20 mm	Cum	7399.00	
5.11		Providing and laying M25 grade Reinforced Cement Concrete Design Mix for superstructure using graded aggregate clean, hard including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) machinery, labour, formwork, cleaning, batching, mixing, placing in position, as directed levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size.			
	5.11.1	40 mm	Cum	8293.00	
	5.11.2	20 mm	Cum	8505.00	
5.12	5.12.1	Providing and laying Plain Cement Concrete Design Mix for foundation and substructure using clean, hard and graded aggregates including cost of all materials machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.12.1.1	M30 Concrete	Cum	7136.00	
	5.12.1.2	M35 Concrete	Cum	7259.00	
	5.12.1.3	M40 Concrete	Cum	7382.00	
	5.12.1.4	M45 Concrete	Cum	7505.00	
	5.12.2	Providing and laying Plain Cement Concrete Design Mix for superstructure using clean, hard			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		and graded aggregates including cost of all materials machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.12.2.1	M30 Concrete	Cum	7706.00	
	5.12.2.2	M35 Concrete	Cum	7829.00	
	5.12.2.3	M40 Concrete	Cum	7952.00	
	5.12.2.4	M45 Concrete	Cum	8075.00	
5.13		Providing and laying Reinforced Cement Concrete Design Mix using clean, hard and graded aggregates for foundation filling and substructure including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.13.1	M30 Concrete	Cum	7902.00	
	5.13.2	M35 Concrete	Cum	8025.00	
	5.13.3	M40 Concrete	Cum	8148.00	
	5.13.4	M45 Concrete	Cum	8271.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
5.14		Providing and laying Reinforced Cement Concrete Design Mix using clean, hard and graded aggregates for superstructure including cost of all materials (excluding cost of providing and placing reinforcement steel/bars) Machinery, labour, formwork, cleaning, batching, mixing, placing in position in alternate panels as directed levelling, compacting, finishing, curing, packing joints of shuttering and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.14.1	M30 Concrete	Cum	8812.00	
	5.14.2	M35 Concrete	Cum	8899.00	
	5.14.3	M40 Concrete	Cum	9058.00	
	5.14.4	M45 Concrete	Cum	9181.00	
5.15		Providing and laying in position Design Mix concrete with temperature reinforcement for 75 mm thick (average) wearing coat over bridge slabs , laid in alternate panels to the required camber, including formwork, tamping, vibration, finishing, curing packing joints of shuttering etc. complete including cleaning RCC surface and applying cement slurry (2kg per Sqm) before laying concrete (excluding cost of reinforcement) and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.15.1	M15 Concrete	Cum	6396.00	
	5.15.2	M20 Concrete	Cum	7084.00	
5.16		Providing and laying in position Design Mix concrete with graded metal of maximum size 20 mm for coping over walls , laid in alternate panels of 1.5 m, including formwork, tamping, vibration, finishing, curing, cleaning, packing joints of shuttering and all other ancillary operations complete including all lead and lifts.			
	5.16.1	Design Mix M15	Cum	6246.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
	5.16.2	Design Mix M20	Cum	6933.00	
5.17		Providing, fabricating, launching and grounding in position, floating steel curbs wells and staining for wells including necessary branching, cutting, edges including all necessary plants and all other ancillary operations complete including all lead and lifts.	Tonne	170720.00	
5.18		Providing, fabricating, and setting out steel well cutting edge of RCC well curb including timber planking, levelling and all other ancillary operations complete including all lead and lifts.	Tonne	146331.00	
5.19	5.19.1	Sinking of wells for foundation to levels as per drawing including dredging as may be necessary including sinking by loading with necessary, Kentledges and other usual means for the type of work including all the plants and machinery etc., complete in all kinds of soil and removal of boulders or tree trunks up to 0.03 Cum average volume except sinking in rock and removal of boulders more than 0.03 Cum volume and all other ancillary operations complete including all lead and lifts. Up to 3m depth	Cum	1625.00	
	5.19.2	Add for Each 3m extra depth beyond initial 3m	Cum	813.00	
5.20		Filling foundation wells with sand in layers of 250 to 300 mm and compacting by watering, ramming as directed including cost of all materials, machinery, labour and all other ancillary operations complete including all lead and lifts.	Cum	918.00	
5.21		Driving or boring R.C.C. piles of the specified design as per detailed drawings for foundations to required levels, including all necessary plants and machinery for the type of work involved cutting and load testing as per specifications and any other protection work for bores if required and all other ancillary operations complete including all lead and lifts (excluding cost of reinforcement).			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
	5.21.1	Up to 6 m depth per cum volume of pile.	Cum	11802.00	
	5.21.2	Add for Each meter extra depth below 6 m substructure.	Cum	1181.00	
5.22		Providing and laying in-situ pumped concrete Design Mix , using graded aggregates clean, hard for piers and abutments deploying batching plant, transit mixer and concrete pump including cost of all materials, machinery, labour, formwork, scaffolding, cleaning, batching, mixing, placing in position levelling, vibrating, finishing, curing and all other ancillary operations complete including all lead and lifts. Using graded aggregates of maximum size 20 mm			
	5.22.1	M20 Concrete	Cum	7117.00	
	5.22.2	M25 Concrete	Cum	7301.00	
	5.22.3	M30 Concrete	Cum	7485.00	
	5.22.4	M35 Concrete	Cum	7669.00	
	5.22.5	M40 Concrete	Cum	7853.00	
	5.22.6	M45 Concrete	Cum	8037.00	
5.23		Providing and filling in foundation M15 grade Cement Concrete Design Mix with graded aggregate of maximum size 40 mm laid under water in foundation pits by skip boxes or tremie pipes including ramming, levelling and all other ancillary operations complete including all lead and lifts.	Cum	5823.00	
5.24		Providing elastomeric bearings such as restrained neoprene bearings or any other type with mild steel plates or shims, manufactured as per specifications given in the approved design of the bearings, including-packing, fixing with adhesives as specified in the design and all other ancillary operations complete including all lead and lifts.	Cubic cm	2.00	
5.25		Providing and constructing PVC pipe weep holes/water spouts for concrete/ masonry walls including cost of all materials, machinery, labour, providing 200x200x200			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		mm size porous concrete block made of cement and 20 mm down coarse aggregate in 1:4 proportion by volume with 100 mm thick sand backing at the junction of wall and soil back fill and all other ancillary operations complete including all lead and lifts.			
	5.25.1	100 mm dia.	M	277.00	
	5.25.2	150 mm dia.	M	356.00	
5.26		Providing and forming expansion joint for bridge consisting of 75x75x6 mm angles 2 numbers provided with 250 mm long 12 mm dia. anchors fixed to both flanges at 150 mm c/c and 140x6 mm plate welded on top of one of the angles including cost of all materials, labour, machinery, providing and fixing 38 mm thick joint filler board matching the thickness of wearing coat, painting and all other ancillary operations complete including all lead and lifts.	M	2801.00	
5.27		Providing and fixing in position, 12 mm thick pre-moulded fillers non-extruding and resilient type (bitumen-impregnated fiber), IS 1838 , on the pier cap including cleaning of surface and all other ancillary operations complete including all lead and lifts.	Sqm	1770.00	
5.28		Providing and fixing in position, to exact profile and pre-stressing high tensile steel of specified ultimate strength, including bending, cutting, tying and providing anchorage, sheathing materials, cable ducts and all other ancillary operations complete including all lead and lifts as per detailed drawings.	Tonne	81389.00	
5.29		Providing and constructing un-coursed rubble stone masonry with approved stones in CM 1:4 proportion by volume for superstructure portions of return walls/ abutments including cost of all materials, machinery, labour, formwork, scaffolding, ramp, cleaning, batching, mixing, mortar, packing mortar and wedging, stone chips into joints, finishing, curing and all other ancillary operations complete	Cum	3464.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		including all lead and lifts.			
5.30		Providing and constructing coursed rubble (size stone) face stone masonry in CM 1:4 proportion by volume with stones from approved source including cost of all materials, machinery, labour, formwork, scaffolding, ramps, cleaning, batching, mixing, mortar, packing mortar and wedging stone chips into joints, finishing, curing and all other ancillary operations complete including all lead and lifts.	Cum	3915.00	
5.31		Providing cement mortar flush pointing to coursed rubble (size stone) face stone masonry in CM 1:2 proportion by volume including cost of all materials, labour, scaffolding, raking and cleaning, joints for 50 mm depth, batching and mixing mortar pressing cement mortar into joints finishing, curing and all other ancillary operations complete including all lead and lifts.	Sqm	115.00	
5.32		Providing cement mortar flush pointing to coursed rubble (size stone) face stone masonry in CM 1:3 proportion by volume including cost of all materials, labour, scaffolding, raking and cleaning, joints for 50 mm depth, batching and mixing mortar pressing cement mortar into joints finishing, curing and all other ancillary operations complete including all lead and lifts.	Sqm	106.00	
5.33		Providing 20 mm thick cement mortar plastering in CM 1:3 proportion by volume in two layers including cost of all materials, labour, scaffolding, raking and cleaning, joints/ surface, batching and mixing mortar, smooth finishing, curing and all other ancillary operations complete including all lead and lifts.	Sqm	244.00	
5.34		Providing 20 mm thick cement mortar plastering in CM 1:4 proportion by volume in two layers including cost of all materials, labour, scaffolding, cleaning, joints/ surface, batching and mixing mortar, smooth finishing,	Sqm	232.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		curing and all other ancillary operations complete including all lead and lifts.			
5.35		Providing Km (kilometer) stone as per type design 2 of WRD Pre-cast in M15 RCC with 20 mm metal including formwork, cost of reinforcement, finishing, curing and all other ancillary operations complete including all lead and lifts.	Each	867.00	
5.36		Fixing Km stone (type design 2) in M15 cement concrete with 40 mm graded metal including excavation (any strata) handling and fixing of stone, curing and all other ancillary operations complete including all lead and lifts.	Each	1183.00	
5.37		Painting Km stone as per type design 2 with canary yellow background of enamel paint and figuring and labelling with black paint including cost of paint brushes and all other ancillary operations complete including all lead and lifts.	Each	183.00	
5.38		Providing 0.2 Km stone made of fine chisel dressed cut stone as per type design 3 of WRD and all other ancillary operations complete including all lead and lifts.	Each	185.00	
5.39		Fixing 0.2 Km stone (type design 3) in M15 cement concrete with 40 mm graded aggregate including excavation (any strata) handling and fixing of stone, curing and all other ancillary operations complete including all lead and lifts.	Each	701.00	
5.40		Painting 0.2 Km stone as per (type design 3) with canary yellow background of enamel paint and figuring and labelling with black paint including cost of paint brushes and all other ancillary operations complete including all lead and lifts.	Each	92.00	
5.41		Providing, laying and jointing non-pressure (NP2) RCC pipes with collar joints including testing of joints (Conforming to IS 458:1988, IS 783:1985) and all other ancillary operations			

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	5
		complete including all lead and lifts.			
	5.41.1	600 mm dia. (NP2) R.C.C. pipes	M	2493.00	
	5.41.2	700 mm dia. (NP2) R.C.C. pipes	M	2792.00	
	5.41.3	800 mm dia. (NP2) R.C.C. pipes	M	3012.00	
	5.41.4	900 mm dia. (NP2) R.C.C. pipes	M	4192.00	
	5.41.5	1000 mm dia. (NP2) R.C.C. pipes	M	4657.00	
	5.41.6	1200 mm dia. (NP2) R.C.C. pipes	M	4996.00	
5.42		Providing, laying and jointing non-pressure (NP3) RCC socket & spigot pipes with rubber gasket joint/ joint caulked with Cement Mortar 1:2 including testing of joints (Conforming to IS 458:1988, IS 783:1985) and all other ancillary operations complete including all lead and lifts.			
	5.42.1	600 mm dia. (NP3) R.C.C. pipes	M	3176.00	
	5.42.2	700 mm dia. (NP3) R.C.C. pipes	M	4222.00	
	5.42.3	800 mm dia. (NP3) R.C.C. pipes	M	5028.00	
	5.42.4	900 mm dia. (NP3) R.C.C. pipes	M	5710.00	
	5.42.5	1000 mm dia. (NP3) R.C.C. pipes	M	7194.00	
	5.42.6	1200 mm dia. (NP3) R.C.C. pipes	M	9029.00	
5.43		Providing, laying and jointing non-pressure (NP4) RCC socket & spigot pipes with rubber gasket joint/ joint caulked with cement mortar 1:2 including testing of joints (Conforming to IS 458:1988, IS 783:1985) and all other ancillary operations complete including all lead and lifts.			
	5.43.1	600 mm dia. (NP4) R.C.C. pipes	M	4053.00	
	5.43.2	700 mm dia. (NP4) R.C.C. pipes	M	4901.00	
	5.43.3	800 mm dia. (NP4) R.C.C. pipes	M	5529.00	
	5.43.4	900 mm dia. (NP4) R.C.C. pipes	M	6637.00	
	5.43.5	1000 mm dia. (NP4) R.C.C. pipes	M	7286.00	
	5.43.6	1200 mm dia. (NP4) R.C.C. pipes	M	9451.00	
5.44		Preparation of old surface of concrete/ masonry after a lapse of 3 months or more for laying fresh concrete by chiseling, sand blasting or by compressed air and water under pressure, including providing and application of cement slurry on old concrete surface, average thickness 6 mm (10 kg cement) and all other ancillary operations complete including all lead and lifts.	Sqm	503.00	

CHAPTER - 6

PRESSURE IRRIGATION NETWORK AND ALLIED WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. Rates include cost of:
 - a) Labour.
 - b) Running charges of machinery including fuel and lubricants.
 - c) All materials required for execution of item of work.
 - d) Unless otherwise specified all lead and lifts.
 - e) Wastage of Cement, Sand, Coarse Aggregate.
 - f) Shuttering, Scaffolding, Form work, Vibration and Curing.
 - g) Testing of materials and quality assurance measures including Mix Design.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items are inclusive of loading and unloading, standard finish required for Works, Cleaning/Preparation of cold and hot joint.
4. All the construction material, workmanship and quality shall conform to the standard prescribed in IS Codes and Specifications/ Guidelines/ Circulars of CG Water Resources Department.
5. For all nominal mixes, mix proportion shall be as per IS 456:2000 (Reaffirmed 2011).
6. The rates of completed items are inclusive of site clearance, haul, roads, working under watery situations, desilting but excluding dewatering and river diversion arrangements wherever applicable.
7. Items related to excavation and earthwork shall be taken from the Chapter -2 - Excavation and Earthwork.
8. Items related to Concrete work not given in this chapter shall be taken from the Chapter-3 - Dam and Allied Works, Chapter-4 -Canal Allied Works and Chapter-5 - Canal Structures.
9. Rates for Electric Sub Station items, Lighting inside and outside Pump House, Earthing for Pump House installation may be adopted as per CGSEB/CGPWD Schedule of rates.
10. Item no. 6.44, 6.45 and 6.46 shall be used for estimation purpose at DPR stage only. For estimation purpose the CCA in consideration has been suitably sub- divided in 5000/4800 ha boundaries beyond rising/gravity mains. In case the total CCA under consideration is less than 5000/4800 ha the cost of Rising Main/Gravity Main shall deemed to be included in this item and separate analysis may be carried out for specific CCA.
11. Item no 6.47 is applicable only for pressurized irrigation scheme which has just finished its O&M period.

12. For MS pipes with external coating of polyurethane/3LPE an ovality/deflection of 5% pipes shall be considered in design, for different types of soil requiring specific backfill as per table no. 6.1 of American Water Works Association Manual M11 (AWWA- M11).

13. The following Indian Standards may be referred to:

IS codes	Title
784: 2001	Pre-stressed Concrete Pipes (Including Specials) Specifications
1710 :1989	Pumps - Vertical Turbine Mixed and Axial Flow, for Clear Cold Water (Reaffirmed 2009)
1916:1989	Steel cylinder pipe with concrete lining and coating specification.
4457: 2007	Ceramic unglazed vitreous acid resisting tile -, Flooring, Wall Finishing and Roofing (Reaffirmed 2012)
4984:1995	High density polyethylene pipes for water supply-specification.
5491: 1969	Code of practice for laying of in-situ granolithic concrete floor topping, CED 5: Flooring, Wall Finishing and Roofing, (Reaffirmed 2001)
5822:1994	Code of practice for laying of electrically welded steel pipes for water supply.
8329:2000	Centrifugally cast (spun) ductile iron pressure pipes for water, gas and sewage – specification.
9012:1978	Recommended practice for shot crating. (Reaffirmed 2002)
10799:1999	Irrigation equipment - design, installation and field evaluation of micro irrigation systems -code of practice.
13062:1991	Irrigation equipment and systems evaluation of field irrigation efficiencies-guidelines.
14792:2000	Irrigation equipment - design, installation and operation of sprinkler irrigation systems-code of practice.
14845: 2000	Resilient Seated Cast Iron Air Relief Valves for Water Works Purposes (Reaffirmed 2010).
14846: 2000	Sluice Valve for Water Works Purposes (50 to 1200 mm Size) (Reaffirmed 2010)
AWWA Manual M-11	Steel pipe -A guide for design and installation.
MoWR, RD, GR & CWC	Guideline for planning and design of piped irrigation network- July 2017.

CHAPTER - 6
PRESSURE IRRIGATION NETWORK AND ALLIED WORKS
Schedule of Rates

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
6.01		Providing and placing sand bags consisting of empty cement bags filled with 35 to 40 kg locally available sand for forming ring bund including cost of all materials, labour, plugging joints with selected earth, including all lead and lifts etc. complete.	Each	49.00	
6.02		Filling clayey soil between two rows of sand bags placed for forming ring bund including cost of all materials, labour, tamping, plugging leakage points including all lead and lifts etc. complete.	Cum	192.00	
6.03		Crossing of Pipeline for Road, Railway and Gas Crossing by Jack Pushing method of suitable diameter hole below the natural ground level and pushing the casing pipe and insertion of carrier pipe including excavation of driving and driven pit up to required depth in all type of strata, transportation of pipe from stock yard to site, including dewatering as per the requirement and with all necessary machineries and equipment, labours and consumables required for completing the work including all lead and lifts, excluding cost of supply, laying and jointing of casing pipe and carrier pipe.			
	6.03.1	Jack pushing for Crossing (300 mm to 800 mm Dia.)	Per RM	51412.00	
	6.03.2	Jack pushing for Crossing (800 mm to 1000 mm Dia.)	Per RM	61556.00	
	6.03.3	Jack pushing for Crossing (More than 1000 mm Dia.)	Per RM	78464.00	
6.04		Design, Supply, Erection, Commissioning and Synchronization of Pumping Station Automation System including PLC (Programmable Logic Controller), field	Per MW	6000000XP ^{0.65}	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		instruments, instruments for Power and Control Cable etc. for Pumping Stations, Substations and Delivery Chambers/ BPT/ Reservoirs along with Control Room at suitable Pumping Station including all communications, integration of Pump House Automation with Air Management System, Surge Protection Devices, etc., complete. (P = Power in MW) Note: This item is applicable only for the projects for which lifting is proposed without any command area development.			
6.05		Design, Supply, Erection and Commissioning of Self Cleaning Automatic Primary Filtration of 200 Micron or less at Intake of required Pump House station. The filter comprises of Self Cleaning Automatic Brush filter Assembly of PN 16 with Control Panels, Instrument Control and Power Cable, Inlet/ Outlet with Isolation Valve for Filter, DPCV (Differential Pressure Control Valves) on Outlet of Filter, Dismantling Joint, Air Valve with Isolation Valve, Flushing Line, Inlet/ Outlet Manifold with Tee, Bends, Connection to Mainline, Companion Flanges, Fastner, Gasket excluding all Civil Works for Filtration System Installation including all lead and lifts etc. complete.	Cum/ hr	1000.00	
6.06		Supplying, fabricating, erecting structural steel members fabricated from rolled steel sections like channels, angles, beams, rails, plates etc., as per specifications and drawings including cost of all materials, machinery, labour, scaffolding, cutting, welding, grinding, cleaning, applying two coats of approved synthetic enamel paint over a coat of zinc chromate red oxide primer paint etc. complete with all lead and lift.	Tonne	149526.00	
6.07		Providing and fixing acid resistant tiles of approved quality for battery room flooring/ dadoing set over a bed of 20 mm thick CM 1: 3 proportion by volume including cost of all materials, machinery, labour, cleaning surface,	Sqm	1510.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		batching and mixing mortar, grouting joints with acid resistant mortar mix, finishing, curing including all lead and lifts etc. complete.			
6.08		Providing and laying 40 mm thick granolithic flooring for pump floor in cement concrete M-25 proportion by volume using 10 mm graded approved clean, hard, aggregates including cost of all materials, machinery, labour, formwork, cleaning surface, batching and mixing concrete, laying concrete in alternate panels of specified size as directed, levelling, tamping, finishing, curing including all lead and lifts etc. complete.	Sqm	298.00	
6.09		Additional rate for adding Ironite compound or floor hardener to concrete. For floors subjected to heavy loads Ironies compound is added to concrete at 2 kg/ Sqm at the time of mixing concrete to impart more hardness to finished floor including all lead and lifts etc. complete.	Sqm	44.00	
6.10		Supplying and laying Pre-stressed concrete pipes (safe for 18 kg/ sqcm test pressure) true to line and level with perfect linking at joint including cost of all materials, machinery, labour, loading, unloading, rolling, lifting and lowering into trench, cleaning socket and spigot ends with soap solution, applying soft soap to socket and spigot, applying soft soap to socket and spigot ends, fixing rubber sealing ring into correct position, jointing pipes perfectly by jacking or other approved method, arranging water for testing, giving necessary hydraulic test at specified test pressure including all lead and lifts etc. complete.			
	6.10.1	800 mm dia. pre-stressed concrete pipes.	M	8119.00	
	6.10.2	1000 mm dia. pre-stressed concrete pipes.	M	9964.00	
	6.10.3	1200 mm dia. pre-stressed concrete pipes.	M	11967.00	
6.11	6.11.1	Manufacturing, supplying, laying in position, aligning, jointing, testing and commissioning of			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		electric resistance welded/ submerged arc welded mild steel (min Fe-410 grade) delivery pipes of specified diameter and plate thickness (as per relevant IS code) with welded ends wherever required and provided one coat of 400 micron thick food grade epoxy paint for inner surface and 1000micron PU/ Epoxy or 3LPE for outer surface including cost of all materials, machinery, labour, cutting, bending, welding, finishing, painting, conveying to spot, lowering, aligning, jointing, arranging water for testing, ultrasonic/ hydraulic testing at fabrication site and after laying and jointing at specified test pressure etc. complete including all lead and lifts as per specifications and approved drawings.			
	6.11.1.1	300 mm Dia. with 4mm Thickness	M	4163.00	
	6.11.1.2	350 mm Dia. with 4 mm Thickness	M	4854.00	
	6.11.1.3	400 mm Dia. with 4 mm Thickness	M	5544.00	
	6.11.1.4	450 mm Dia. with 4 mm Thickness	M	6234.00	
	6.11.1.5	500 mm Dia. with 5 mm Thickness	M	8223.00	
	6.11.1.6	600mm Dia. with 5 mm Thickness	M	9861.00	
	6.11.1.7	700 mm Dia. with 6 mm Thickness	M	13314.00	
	6.11.1.8	750 mm Dia. with 6 mm Thickness	M	14262.00	
	6.11.1.9	800 mm Dia. with 6 mm Thickness	M	15210.00	
	6.11.1.10	900 mm Dia. with 6 mm Thickness	M	17105.00	
	6.11.1.11	1000 mm Dia. with 6 mm Thickness	M	19001.00	
	6.11.1.12	1100 mm Dia. with 7 mm Thickness	M	20896.00	
	6.11.1.13	1200 mm Dia. with 8 mm Thickness	M	29002.00	
	6.11.1.14	1300 mm Dia. with 8 mm Thickness	M	31412.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.11.1.15	1400 mm Dia. with 8 mm Thickness	M	33822.00	
	6.11.1.16	1500 mm Dia. with 9 mm Thickness	M	40114.00	
	6.11.1.17	1600 mm Dia. with 10 mm Thickness	M	46922.00	
	6.11.1.18	1700 mm Dia. with 10 mm Thickness	M	49846.00	
	6.11.1.19	1800 mm Dia. with 10 mm Thickness	M	52771.00	
	6.11.1.20	1900 mm Dia. with 12 mm Thickness	M	65529.00	
	6.11.1.21	2000 mm Dia. with 12mm Thickness	M	68968.00	
	6.11.1.22	2100 mm Dia. with 12 mm Thickness	M	72408.00	
	6.11.1.23	2200 mm Dia. with 12 mm Thickness	M	75847.00	
	6.11.1.24	2300 mm Dia. with 14 mm Thickness	M	91188.00	
	6.11.1.25	2400 mm Dia. with 14 mm Thickness	M	95142.00	
	6.11.1.26	2500 mm Dia. with 14 mm Thickness	M	99096.00	
	6.11.1.27	2600 mm Dia. with 14 mm Thickness	M	103049.00	
	6.11.1.28	2700 mm Dia. with 16 mm Thickness	M	120974.00	
	6.11.1.29	2800 mm Dia. with 16 mm Thickness	M	125442.00	
	6.11.1.30	2900 mm Dia. with 16 mm Thickness	M	129911.00	
	6.11.1.31	3000 mm Dia. with 16 mm Thickness	M	134379.00	
6.11.2		The rate of fabricated MS pipe of various diameter and thickness as per design and specifications without coating. (To be used for thickness of MS pipes other than mentioned in item 6.11.1) including all lead and lifts.	Tonne	116500.00	
6.12		Design, manufacture, supply, erection, trial running, performance testing and commissioning of vertical turbine pump of approved make conforming to IS 1710 having specified pump output under specified			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		operating head coupled to HT motor of adequate HP rating operating at 6.6 KV with flexible coupling, self-water lubricated thrust bearings, discharge Tee with flanged end for connecting delivery pipe with all other standard accessories and safety devices etc., complete including all lead and lifts as per specifications, terms and conditions of contract.			
	6.12.1	VT pump with more than 1000 hp up to 1500 hp motor	set/ hp	15680.00	
	6.12.2	VT pump with more than 1500 hp up to 2000 hp motor	set/ hp	16547.00	
	6.12.3	VT pump with more than 2000 hp up to 2500 hp motor	set/ hp	17405.00	
	6.12.4	VT pump with more than 2500 hp up to 3000 hp motor	set/ hp	18255.00	
	6.12.5	VT pump with more than 3000 hp up to 3500 hp motor	set/ hp	19096.00	
6.13		Design, fabrication, supply, assembling, testing and commissioning of HT pump panel board made of sheet metal duly painted with recess for cable entries at the bottom suitable for 6.6 KV equipped with vacuum circuit breaker of suitable capacity for 1 number incoming 1600A and 2 numbers 630A outgoing of suitable capacity with aluminum bus bars of 1600Amp metering panel, protection relays and all other accessories complete with wiring as per specifications and approved drawings including all lead and lifts.			
	6.13.1	Panel board with fittings common to all pumps	Set	1848000.00	
	6.13.2	Additional VCB including sheet metal enclosure, extension bus bars, metering and relays complete for Each additional pump mounted on common panel board.	Set/ Pump	652960.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		Note: Rate for complete set of pump panel board= Rate for common VCB and fittings + (Rate for additional VCB per pump x Number of additional pumps)			
6.14		Design, fabrication, supply, assembling, testing and commissioning of Remote control panel made of sheet metal in desk type configuration duly painted with recess for cable entries at the bottom equipped with operating consoles, indicators, enumeration windows, hooters and all other accessories assembled and ready to receive control wires and other connections etc. complete including all lead and lifts as per specifications and approved drawings.	Per pump	55440.00	
		Note: Rate per complete set of Remote control panel =Rate for Remote control panel for Each pump x Number of pumps			
6.15		Supply, installation and commissioning of High tension Power factor capacitor bank of specified Kavar rating operating at 6.6 KV with all accessories etc. complete including all lead and lifts as per specifications, terms and conditions of contract.	Per KVAr	986.00	
		Note: Rate for PF capacitor bank set/ pump =Specified Kavar rating x Rate per 50 Kavar/ 50			
6.16		Supply, installation and commissioning of Load Break Switch with HRO fuses, CBCT and ELR in sheet metal enclosure with operating console etc. complete including all lead and lifts for use along with Power factor Capacitor Bank as per specifications, terms and conditions of contract.	Per Set	466620.00	
6.17		Supply and installation of Auxiliary DC supply system of approved make with battery charger Cum DCDB with batteries for 110 A hour etc. complete with all accessories including all lead	Per Set	843920.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		and lifts.			
6.18		Supplying and installing Temperature scanner suitable for operating at 110 V DC or 230 V AC mounted in a duly painted sheet metal enclosure provided with NO/ NC relays for transmitting signal to VCBS for tripping with audible alarm for both windings and bearing RTDs with all other accessories for satisfactory functioning of the system including all lead and lifts etc. complete.	Per Set	95480.00	
6.19		Supplying, installing and commissioning electrode actuated water level transmitter of approved make with all accessories to protect against dry running of pump including all lead and lifts etc. complete.	Per Set	194040.00	
6.20		Supplying, installing and commissioning electro-magnetic type flow meter of approved make with all accessories including display panel in the pump house including all lead and lifts.	Per Set	1478431.00	
6.21		Supply and installation of floor mounting type LTAC panel of approved make fabricated from sheet metal and painted with provision for suitable incoming and specified number of outgoing feeder inlets with metering panel and all other accessories complete for auxiliary supply as per specifications, terms and conditions of contract including all lead and lifts etc. complete.	Each	468160.00	
6.22		Supply and installation of Auxiliary transformer 6.6 KV/ 433 Volts 160 KVA copper wound, insulating oil filled with all accessories etc. complete as per specifications including all lead and lifts.	Each	400400.00	
6.23		Fabricating, supplying, erecting, testing and commissioning 6.6 KV 2500A capacity wall entry type bus duct with flexible end connectors to connect transformer and HT motor panel inside pump house with all accessories,	M	49280.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		supports etc., complete including all lead and lifts as per specifications and drawings.			
6.24		Supplying, laying and connecting XLPE 6.6 KV(E) 3 core cable suitable for 28 KA short circuit rating with end connectors from HT panel to motor, starters, capacitor panels etc. complete including all lead and lifts as per directions.			
	6.24.1	3 core 95 sum cable	M	755.00	
	6.24.2	3 core 120 sum cable	M	1171.00	
	6.24.3	3 core 240 sum cable	M	1355.00	
	6.24.4	3 core 400 sum cable	M	2095.00	
6.25		Supply, installation and commissioning of soft starter for specified KW load operating at 6.6 KV with load break switch, metering, protection by-pass vacuum contactor with all accessories etc. complete including all lead and lifts housed in painted sheet metal enclosure	per kw load	1848.00	
		Note: Rate for Soft starter set per pump = Specified kW load x Rate per 500 kW/ 500			
6.26		Supplying, installing, testing and commissioning (SITC) electrically actuated Wafer type flanged Butterfly valve PN (Pressure numbers) 1.0 Class conforming to BS : 5155 of specified diameter and approved make with gear box, electric motor and extension stem and all other accessories for perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour, including all lead and lifts etc. complete.			
	6.26.1	400 mm diameter butterfly valve with	Per Set	50258.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		accessories			
	6.26.2	500 mm diameter butterfly valve with accessories	Per Set	86482.00	
	6.26.3	600 mm diameter butterfly valve with accessories	Per Set	124616.00	
6.27		Supplying, installing, testing and commissioning (SITC) electrically actuated Wafer type flanged Butterfly valve PN (Pressure numbers) 1.6 Class conforming to BS : 5155 of specified diameter and approved make with gear box, electric motor and extension stem and all other accessories for perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour including all lead and lifts etc. complete.			
	6.27.1	400 mm diameter butterfly valve with accessories	Per Set	55548.00	
	6.27.2	500 mm diameter butterfly valve with accessories	Per Set	91723.00	
	6.27.3	600 mm diameter butterfly valve with accessories	Per Set	129808.00	
6.28		Supplying, installing, testing and commissioning (SITC) electrically actuated Double flanged Butterfly valve PN 1.0 Class conforming to IS 13905 of specified diameter and approved make with gear box, electric motor and extension stem and all other accessories for perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour etc. Complete including all lead and lifts.			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.28.1	700 mm diameter butterfly valve with accessories	Per Set	409703.00	
	6.28.2	800 mm diameter butterfly valve with accessories	Per Set	511124.00	
	6.28.3	900 mm diameter butterfly valve with accessories	Per Set	612144.00	
	6.28.4	1000 mm diameter butterfly valve with accessories	Per Set	732630.00	
	6.28.5	1100 mm diameter butterfly valve with accessories	Per Set	914600.00	
	6.28.6	1200 mm diameter butterfly valve with accessories	Per Set	1155215.00	
6.29		Supplying, installing, testing and commissioning (SITC) electrically actuated Double flanged Butterfly valve PN 1.6 Class conforming to IS 13905 of specified diameter and approved make with gear box, electric motor and extension stem and all other accessories for perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour including all lead and lifts etc. complete.			
	6.29.1	700 mm diameter butterfly valve with accessories	Per Set	459666.00	
	6.29.2	800 mm diameter butterfly valve with accessories	Per Set	563483.00	
	6.29.3	900 mm diameter butterfly valve with accessories	Per Set	696749.00	
	6.29.4	1000 mm diameter butterfly valve with accessories	Per Set	849354.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.29.5	1100 mm diameter butterfly valve with accessories	Per Set	1041008.00	
	6.29.6	1200 mm diameter butterfly valve with accessories	Per Set	1278899.00	
6.30		Supplying and fixing Butterfly valve actuator DOL panel board with push button starter and all other accessories including wiring for specified number of valves including all lead and lifts etc. complete.	Per Set	409507.00	
6.31		Supplying, installing, testing and commissioning (SITC) Cast steel double flanged dual plate Check valve Class 150 conforming to API 594 of approved make of specified diameter and to withstand specified pressure with all accessories true to line and perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour including all lead and lifts etc. complete.			
	6.31.1	400 mm diameter check valve with Accessories	Per Set	119913.00	
	6.31.2	500 mm diameter check valve with accessories	Per Set	149598.00	
	6.31.3	600 mm diameter check valve with accessories	Per Set	186630.00	
	6.31.4	700 mm diameter check valve with accessories	Per Set	250833.00	
	6.31.5	800 mm diameter check valve with accessories	Per Set	339567.00	
	6.31.6	900 mm diameter check valve with accessories	Per Set	456397.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.31.7	1000 mm diameter check valve with Accessories	Per Set	614730.00	
	6.31.8	1100 mm diameter check valve with accessories	Per Set	828281.00	
	6.31.9	1200 mm diameter check valve with accessories	Per Set	1118053.00	
6.32		Supplying, installing, testing and commissioning (SITC) Cast steel double flanged dual plate Check valve Class 300 conforming to API 594 of approved make of specified diameter and to withstand specified pressure with all accessories true to line and perfect linking with pipes on either side including loading, unloading, lifting and placing in correct position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joints, cost of all jointing materials, machinery, labour including all lead and lifts etc. complete.			
	6.32.1	400 mm diameter check valve with accessories	Per Set	132404.00	
	6.32.2	500 mm diameter check valve with accessories	Per Set	164557.00	
	6.32.3	600 mm diameter check valve with accessories	Per Set	206537.00	
	6.32.4	700 mm diameter check valve with accessories	Per Set	278151.00	
	6.32.5	800 mm diameter check valve with accessories	Per Set	374268.00	
	6.32.6	900 mm diameter check valve with accessories	Per Set	504634.00	
	6.32.7	1000 mm diameter check valve with accessories	Per Set	678919.00	
	6.32.8	1100 mm diameter check valve with accessories	Per Set	915793.00	
	6.32.9	1200 mm diameter check valve with accessories	Per Set	1233798.00	
6.33		Supplying, fixing and commissioning D.I Scour valve (sluice valve) of approved make body and seat ring of bronze PN (Pressure numbers)			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		1.0 conforming to IS 14846 of specified diameter and to withstand specified pressure with all accessories true to line and perfect linking with pipes on either side including loading, unloading, lifting and placing in position, cleaning ends, inserting gaskets into correct position, jointing pipes and valve to form water tight joint, cost of all jointing materials, machinery, labour including all lead and lifts etc. complete.			
	6.33.1	100 mm diameter scour valve with accessories	Per Set	10541.00	
	6.33.2	150 mm diameter scour valve with accessories	Per Set	16159.00	
	6.33.3	200 mm diameter scour valve with accessories	Per Set	28837.00	
	6.33.4	250 mm diameter scour valve with accessories	Per Set	41018.00	
6.34		Supplying, fixing and commissioning D.I Tamper proof Air valve of approved make body and seat ring of bronze PN (Pressure numbers) 1.0 conforming to IS 14845 of specified diameter with all fixtures including cost of all materials, machinery, labour including all lead and lifts etc. complete.			
	6.34.1	80 mm diameter Air valve with accessories	Per Set	24015.00	
	6.34.2	100 mm diameter Air valve with accessories	Per Set	28092.00	
	6.34.3	150 mm diameter Air valve with accessories	Per Set	51708.00	
	6.34.4	200 mm diameter Air valve with accessories	Per Set	55686.00	
6.35		Supplying, fixing and commissioning D.I Tamper proof Air valve of approved make body and seat ring of bronze PN (Pressure numbers) 1.6 conforming to IS 14845 of specified diameter with all fixtures including cost of all materials, machinery, labour including all lead and lifts etc. complete.			
	6.35.1	80 mm diameter Air valve with accessories	Per Set	25357.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.35.2	100 mm diameter Air valve with accessories	Per Set	31323.00	
	6.35.3	150 mm diameter Air valve with accessories	Per Set	52454.00	
	6.35.4	200 mm diameter Air valve with accessories	Per Set	56680.00	
6.36		Design, manufacture, supply, erection, trial running, testing and commissioning of vertical turbine pumps of approved make conforming to IS 1710 having specified pump output specified operating head coupled to LT motor of adequate hp rating operating at 400 to 440 volts $\pm 5\%$, 3 phase with flexible coupling, self-water lubricated thrust bearing, discharge tee with flange end or connecting delivery pipe with all other standard accessories and safety device etc. complete as per specification and condition of contract Rate rounded for VT pumps with motor- per hp per set up to 500 HP including all lead and lifts.	per hp/ set	12549.00	
6.37		Design, manufacture, supply, erection, trial running and commissioning of Auto transformer starter or equivalent for specified KW/ HP load operating at LT 400 to 440 volts $\pm 5\%$, 3 phase with Load break switch metering, protection etc. with all accessories etc. complete housed in painted sheet metal enclosure. LT system up to 500 hp/ 375 kw the rates per 100kw rounded including all lead and lifts.	Per 100 kw per set	313440.00	
6.38		Design, manufacture, supply, erection, trial running, testing and commissioning of LT control panel for specified KW/ HP load operating at LT 400 to 440 volts $\pm 5\%$, 3 phase equipped with circuit breaker of suitable capacity with aluminum bus bars of required load amp metering panel ,protection relays switch ,metering ,protection etc. with all accessories complete with wiring ,made of sheet metal duly painted with recess for cable entries at the bottom housed in painted sheet metal enclosure as per specification and approved drawing. rate of LT panel up to 500	Per Set	1330028.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		hp set including all lead and lifts etc., complete.			
6.39		Centrifugal Coupled Pump Set-Erection charges: -Erecting and giving test of centrifugal coupled pump set with foot mounted motor excluding base plate coupling and foundation bolts etc., complete on provided concrete foundation/ RSJ with accurate levelling with shims and proper alignment including all lead and lifts.			
	6.39.1	15 to 30 hp	Each	5003.00	
	6.39.2	31 to 50 hp	Each	5987.00	
	6.39.3	51 to 100 hp	Each	7136.00	
	6.39.4	101 to 150 hp	Each	8550.00	
	6.39.5	151 to 200 hp	Each	9964.00	
	6.39.6	201 to 250 hp	Each	11399.00	
	6.39.7	251 to 300 hp	Each	13674.00	
	6.39.8	More than 300 hp (Add extra for Each hp)	per hp	62.00	
6.40	6.40.1	Supplying and fixing Mild Steel (MS) fabricated expansion joint confirming to IS 2062 E250 BR including all lead and lifts etc., complete.			
	6.40.1.1	300 mm dia. PN 10 to PN 16	Each	60891.00	
	6.40.1.2	350 mm dia. PN 10 to PN 16	Each	65241.00	
	6.40.1.3	400 mm dia. PN 10 to PN 16	Each	81551.00	
	6.40.1.4	450 mm dia. PN 10 to PN 16	Each	92425.00	
	6.40.1.5	500 mm dia. PN 10 to PN 16	Each	104385.00	
	6.40.1.6	600 mm dia. PN 10 to PN 16	Each	121784.00	
	6.40.1.7	700 mm dia. PN 10 to PN 16	Each	141355.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.40.1.8	750 mm dia. PN 10 to PN 16	Each	173975.00	
	6.40.1.9	800 mm dia. PN 10 to PN 16	Each	208407.00	
	6.40.1.10	900 mm dia. PN 10 to PN 16	Each	235591.00	
	6.40.1.11	1000 mm dia. PN 10 to PN 16	Each	280896.00	
	6.40.1.12	1100 mm dia. PN 10 to PN 16	Each	317141.00	
	6.40.1.13	1200 mm dia. PN 10 to PN 16	Each	344324.00	
	6.40.2	Supplying and fixing Mild Steel (MS) fabricated expansion joint confirming to IS 2062 E250 BR including all lead and lifts etc. complete.			
	6.40.2.1	300 mm dia. PN 20 to PN 25	Each	76115.00	
	6.40.2.2	350 mm dia. PN 20 to PN 25	Each	81552.00	
	6.40.2.3	400 mm dia. PN 20 to PN 25	Each	101939.00	
	6.40.2.4	450 mm dia. PN 20 to PN 25	Each	115529.00	
	6.40.2.5	500 mm dia. PN 20 to PN 25	Each	130482.00	
	6.40.2.6	600 mm dia. PN 20 to PN 25	Each	148086.00	
	6.40.2.7	700 mm dia. PN 20 to PN 25	Each	176692.00	
	6.40.2.8	750 mm dia. PN 20 to PN 25	Each	217468.00	
	6.40.2.9	800 mm dia. PN 20 to PN 25	Each	260509.00	
	6.40.2.10	900 mm dia. PN 20 to PN 25	Each	294489.00	
	6.40.2.11	1000 mm dia. PN 20 to PN 25	Each	351120.00	
	6.40.2.12	1100 mm dia. PN 20 to PN 25	Each	396426.00	
	6.40.2.13	1200 mm dia. PN 20 to PN 25	Each	430407.00	
	6.40.2.14	1300 mm dia. PN 20 to PN 25	Each	364359.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.40.2.15	1400 mm dia. PN 20 to PN 25	Each	390798.00	
	6.40.2.16	1500 mm dia. PN 20 to PN 25	Each	417239.00	
	6.40.2.17	1600 mm dia. PN 20 to PN 25	Each	443680.00	
	6.40.2.18	1700 mm dia. PN 20 to PN 25	Each	470120.00	
	6.40.2.19	1800 mm dia. PN 20 to PN 25	Each	496562.00	
	6.40.2.20	1900 mm dia. PN 20 to PN 25	Each	523000.00	
	6.40.2.21	2000 mm dia. PN 20 to PN 25	Each	549442.00	
	6.40.2.22	2100 mm dia. PN 20 to PN 25	Each	575883.00	
	6.40.2.23	2200 mm dia. PN 20 to PN 25	Each	602324.00	
	6.40.2.24	2300 mm dia. PN 20 to PN 25	Each	628764.00	
	6.40.2.25	2400 mm dia. PN 20 to PN 25	Each	655205.00	
	6.40.2.26	2500 mm dia. PN 20 to PN 25	Each	681647.00	
6.41	6.41.1	Supplying and fixing Mild Steel (MS) fabricated Dismantling joint confirming to IS 2062 E250 BR including all lead and lifts etc. complete.			
	6.41.1.1	300 mm dia. PN 10 to PN 16	Each	15750.00	
	6.41.1.2	350 mm dia. PN 10 to PN 16	Each	22050.00	
	6.41.1.3	400 mm dia. PN 10 to PN 16	Each	29400.00	
	6.41.1.4	450 mm dia. PN 10 to PN 16	Each	34650.00	
	6.41.1.5	500 mm dia. PN 10 to PN 16	Each	42000.00	
	6.41.1.6	600 mm dia. PN 10 to PN 16	Each	51660.00	
	6.41.1.7	700 mm dia. PN 10 to PN 16	Each	67410.00	
	6.41.1.8	750 mm dia. PN 10 to PN 16	Each	82950.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
	6.41.1.9	800 mm dia. PN 10 to PN 16	Each	88200.00	
	6.41.1.10	900 mm dia. PN 10 to PN 16	Each	98700.00	
	6.41.1.11	1000 mm dia. PN 10 to PN 16	Each	129150.00	
	6.41.1.12	1100 mm dia. PN 10 to PN 16	Each	164850.00	
	6.41.1.13	1200 mm dia. PN 10 to PN 16	Each	202650.00	
	6.41.2	Supplying and fixing Mild Steel (MS) fabricated Dismantling joint confirming to IS 2062 E250 BR including all lead and lifts etc. complete.			
	6.41.2.1	300 mm dia. PN 20 to PN 25	Each	19700.00	
	6.41.2.2	350 mm dia. PN 20 to PN 25	Each	27600.00	
	6.41.2.3	400 mm dia. PN 20 to PN 25	Each	36750.00	
	6.41.2.4	450 mm dia. PN 20 to PN 25	Each	43350.00	
	6.41.2.5	500 mm dia. PN 20 to PN 25	Each	52500.00	
	6.41.2.6	600 mm dia. PN 20 to PN 25	Each	64575.00	
	6.41.2.7	700 mm dia. PN 20 to PN 25	Each	84300.00	
	6.41.2.8	750 mm dia. PN 20 to PN 25	Each	103700.00	
	6.41.2.9	800 mm dia. PN 20 to PN 25	Each	110250.00	
	6.41.2.10	900 mm dia. PN 20 to PN 25	Each	123375.00	
	6.41.2.11	1000 mm dia. PN 20 to PN 25	Each	161450.00	
	6.41.2.12	1100 mm dia. PN 20 to PN 25	Each	206100.00	
	6.41.2.13	1200 mm dia. PN 20 to PN 25	Each	253350.00	
6.42		Providing, laying, Jointing & field testing of High Density Polyethylene pipes, (HDPE) PE100 PN6 confirming to IS 4984/ 14151/ 12786/ 13488 with necessary jointing of pipes by electrofusion/ butt welding process with all			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		leads and lifts including all lead and lifts etc. complete.			
	6.42.1	63 mm dia. pipes	M	133.00	
	6.42.2	75 mm dia. pipes	M	190.00	
	6.42.3	90 mm dia. pipes	M	259.00	
	6.42.4	110 mm dia. pipes	M	372.00	
	6.42.5	125 mm dia. pipes	M	483.00	
	6.42.6	140 mm dia. pipes	M	601.00	
	6.42.7	160 mm dia. pipes	M	780.00	
	6.42.8	180 mm dia. pipes	M	980.00	
	6.42.9	200 mm dia. pipes	M	1209.00	
	6.42.10	225 mm dia. pipes	M	1530.00	
	6.42.11	250 mm dia. pipes	M	1875.00	
	6.42.12	280 mm dia. pipes	M	2336.00	
	6.42.13	315 mm dia. pipes	M	2953.00	
	6.42.14	355 mm dia. pipes	M	3758.00	
	6.42.15	400 mm dia. pipes	M	4850.00	
	6.42.16	450 mm dia. pipes	M	6138.00	
	6.42.17	500 mm dia. pipes	M	7607.00	
	6.42.18	560 mm dia. pipes	M	9480.00	
	6.42.19	630 mm dia. pipes	M	12010.00	
	6.42.20	710 mm dia. pipes	M	12154.00	
6.43		Providing, Laying and jointing following socket & spigot centrifugally cast (spun) Ductile Iron			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		pressure pipe with inner and outer coating (class K-7) conforming to IS 8329:2000 with suitable rubber gasket (Push on) joint as per IS 5382:1985 including cost of rubber gasket, complete including all lead and lifts.			
	6.43.1	300 mm dia. pipes	M	4514.00	
	6.43.2	350 mm dia. pipes	M	5455.00	
	6.43.3	400 mm dia. pipes	M	6729.00	
	6.43.4	450 mm dia. pipes	M	7920.00	
	6.43.5	500 mm dia. pipes	M	9233.00	
	6.43.6	600 mm dia. pipes	M	11972.00	
	6.43.7	700 mm dia. pipes	M	15407.00	
	6.43.8	750 mm dia. pipes	M	18211.00	
	6.43.9	800 mm dia. pipes	M	20250.00	
	6.43.10	900 mm dia. pipes	M	24883.00	
	6.43.11	1000 mm dia. pipes	M	29620.00	
6.44		<p>Survey, planning, design and construction of underground pressurized pipe distribution network for micro irrigation system excluding the cost of rising & gravity mains and sprinkler/ drip system to facilitate pressurized irrigation with duty 0.35 lit/ sec/ ha and working/ operating pressure of minimum 6.0 kg/ sqcm with following provisions: -</p> <ol style="list-style-type: none"> 1. HDPE pipe of category PE 100 PN 6 for diameter of pipe below 300 mm conforming to relevant IS codes 2. MS/ DI for pipe of diameter 300 mm and above conforming to relevant IS codes. 3. MS pipes with 400 micron food grade 			

Item No.	Description of item	Unit	Rate	Remarks
1	2	3	4	5
	<p>epoxy for inner surface and 1000 micron PU/ epoxy or 3LPE on outer surface.</p> <p>4. Ductile Iron pressure pipe with inner and outer coating (class K-7) conforming to IS 8329:2000 with suitable rubber gasket (Push on) joint as per IS 5382:1985 including cost of rubber gasket. The rates are inclusive of: -</p> <p>(A)- All works like excavation, preparation of bedding, laying, joining, backfilling testing and commissioning and testing of the system as per specifications and code provisions., crossing of all natural drainage, nallas as per requirement of work complete.</p>			
	<p>(B)- Providing and fixing all required valves, bends, manifolds, controls etc. conforming to related BIS/ European standards and including Supply, Erection and Commissioning, testing of Outlet Management System control at minimum 20/ 30 ha which should be able to control the flow as per desired minimum pressure of 2.3 kg/ sqcm and 2 kg/ sqcm at 5.0 and 1.0 hectare respectively with uniform distribution of water to all the users irrespective of its location, elevation and distance from the water supply source including recording, measuring, monitoring and control with suitable power source and alternatively by solar power with three days back up capacity with no recurring cost for Communication with GSM/ GPRS/ RADIO etc. System should be kept in Protective Enclosure capable of giving vandalism alert and shall be SCADA compliant to the main control room operations including of all material, labour, lead, lift and all incidental charges. (This item shall be used for estimation purpose at DPR stage only. For estimation purpose the CCA in consideration has been suitably sub- divided in 5000/ 4800 ha boundaries beyond rising/ gravity mains. In case the total CCA under consideration is less than 5000/ 4800 ha the cost of RM/ GM shall</p>			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		deemed to be included in this item.) Note: - Outlet point should be at centre and residual head with respect to highest level of Chak.			
6.44.1		Up to center of 2.5 ha Chak			
	6.44.1.1	From 5000 to 500 ha Chak.	ha	42220.00	
	6.44.1.2	500 ha to 20 ha Chak.	ha	63000.00	
	6.44.1.3	20 ha to outlet 5 ha with 8 times duty (including Cost of SCADA, valves, bends, manifolds, controls, Outlet Management System, outlet with 4 manual valves with 8 times duty for at least 1.25 ha area i/c communications, Protective Enclosure and solar power with three days backup with PFCMD (pressure flow control metering device) control up to 5 ha)	ha	27650.00	
	6.44.1.4	5 ha to 2.5 ha with 8 times duty (including cost of valves, bends & manifolds. outlet with manual valve at two and half hectare i/c communications)	ha	17790.00	
6.44.2		Up to centre of 1.0 ha Chak			
	6.44.2.1	From 4800 to 300 ha Chak.	ha	63350.00	
	6.44.2.2	300 ha to 30 ha Chak.	ha	31960.00	
	6.44.2.3	30 ha to outlet to 5 ha with 10 times duty (including Cost of SCADA, valves, bends, manifolds, controls , Outlet Management System, outlet with 5 manual valves with 10 times duty for at least 1 ha area i/c communications, Protective Enclosure and solar power with three days backup with PFCMD (pressure flow control metering device) control up to 5 ha)	ha	29580.00	
	6.44.2.4	5 ha to 1 ha with 10 times duty (including cost of valves, bends & manifolds. outlet with manual valve at one hectare i/c communications)	ha	32100.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
6.45		<p>Survey, planning, design and construction of underground pressurized pipe distribution network for micro irrigation system excluding the cost of rising & gravity mains and sprinkler/ drip system to facilitate pressurized irrigation with duty 0.35 lit/sec/ha and working/ operating pressure of minimum 6.0 kg/ sqcm with following provisions: -</p> <p>1- HDPE pipe of category PE 100 PN 6 for diameter of pipe below 300 mm conforming to relevant IS codes.</p> <p>2- DI for pipe of diameter 300 mm and above up to 600mm conforming to relevant IS codes.</p> <p>3- MS/ DI for pipe of diameter above 600 mm conforming to relevant IS codes.</p> <p>4- MS pipes with 400 micron food grade epoxy/ 500 micron polyurethane for inner surface and shotcrete lining/ 1000 micron polyurethane/ Epoxy or 3LPE on outer surface. Ductile Iron pressure pipe with inner and outer coating (class K-7) conforming to IS 8329:2000 with suitable rubber gasket (Push on) joint as per IS 5382:1985 including cost of rubber gasket.</p> <p>5- The rates are inclusive of: -</p> <p>(A)- All works like excavation, preparation of bedding, laying, joining, backfilling testing and commissioning and testing of the system as per specifications and code requirements crossing of all natural drainage, nallas as per requirement of work complete.</p> <p>(B)-Providing and fixing all required valves, bends, manifolds, controls etc., conforming to related BIS/ European standards and including Supply, Erection and Commissioning, testing of Outlet Management System control at minimum 20/ 30 ha which should be able to</p>			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		<p>control the flow as per desired minimum pressure of 2.3 kg/ sqcm and 2 kg/ sqcm at 5.0 hectare and 1.0 hectare respectively with uniform distribution of water to all the users irrespective of its location, elevation and distance from the water supply source including recording, measuring, monitoring and control with suitable power source and alternatively by solar power with three days back up capacity with no recurring cost for Communication with GSM/ GPRS/ RADIO etc.</p> <p>System should be kept in Protective Enclosure capable of giving vandalism alert and shall be SCADA compliant to the main control room operations including of all material, labour, lead, lift and all incidental charges. (This item shall be used for estimation purpose at DPR stage only. For estimation purpose the CCA in consideration has been suitably sub- divided in 5000/ 4800 ha boundaries beyond rising/ gravity mains. In case the total CCA under consideration is less than 5000/ 4800 ha the cost of RM/ GM shall deemed to be included in this item.)</p> <p>Note: - Outlet point should be at centre and residual head with respect to highest level of Chak.</p>			
6.45.1		Up to 2.5 ha Chak			
	6.45.1.1	From 5000 to 500 ha Chak.	ha	42890.00	
	6.45.1.2	500 ha to 20 ha Chak.	ha	61350.00	
	6.45.1.3	20 ha to outlet 5 ha with 8 times duty (including Cost of SCADA, valves, bends, manifolds, controls, Outlet Management System, outlet with 4 manual valves with 8 times duty for at least 1.25 ha area i/c communications, Protective Enclosure and solar power with three days backup with PFCMD (pressure flow control metering device) control up to 5 Ha)	ha	27650.00	
	6.45.1.4	5 ha to 2.5 ha with 8 times duty (including cost of valves, bends & manifolds. outlet with	ha	17790.00	

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		manual valve at two and half hectare i/c communications)			
6.45.2		Up to 1.0 ha Chak			
	6.45.2.1	From 4800 to 300 ha Chak.	ha	63830.00	
	6.45.2.2	300 ha to 30 ha Chak.	ha	31500.00	
	6.45.2.3	30 ha to outlet to 5 ha with 10 times duty (including Cost of SCADA, valves, bends, manifolds, controls, Outlet Management System, outlet with 5 manual valves with 10 times duty for at least 1 ha area i/c communications, Protective Enclosure and solar power with three days backup with PFCM (pressure flow control metering device) control up to 5 ha)	ha	29580.00	
	6.45.2.4	5 ha to 1 ha with 10 times duty (including cost of valves, bends & manifolds. outlet with manual valve at one hectare i/c communications)	ha	32100.00	
6.46		Design and construction of underground pipe distribution network for hose irrigation system, excluding rising main but with pressurized irrigation with duty of 0.45 lit/ sec/ ha and of working/ operating pressure not exceeding 4.0kg/sqcm with following provisions: 1 HDPE/ DWC/ SPIRAL DWC/ M S / DI pipe conforming to BIS codes and relevant international specifications for pipes 63 mm to 900 mm diameter. 2.Pipes of MS/ DI conforming to relevant BIS codes for pipe dia. greater than 900 mm. 3.MS pipes shall be with 400 micron food grade epoxy/ 500 micron polyurethane for inner surface and 1000 micron PU/ Epoxy or 3LPE coating on outer surface. 4.Ductile Iron pressure pipe with inner and			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		<p>outer coating (class K-7) conforming to IS 8329:2000 with suitable rubber gasket (Push on) joint as per IS 5382:1985 including cost of rubber gasket.</p> <p>(A)- All works like excavation, preparation of bedding, laying, joining, backfilling testing and commissioning and testing of the system as per specifications and code requirements. crossing of all natural drainage, nallas as per requirement of work complete.</p>			
		<p>(B)-Providing and fixing all required valves, bends, manifolds, controls etc. conforming to related BIS/ European standards and including Supply, Erection and Commissioning, testing of Outlet Management System with outlet duty of 0.45 lit/ sec/ ha up to minimum 30 ha which should be able to control the flow as per desired minimum pressure of 4 meter and 1.5 meter exit gradient at 5 ha and 1 ha respectively outlet which shall consist of orifice type of nozzle able to deliver desired flow of 10 times duty at highest point of field facilitating uniform distribution of water to all the users irrespective of its location, elevation and distance from the water supply source including recording, measuring, monitoring and control with suitable power source and alternatively by solar power with three days back up capacity with no recurring cost for Communication with GSM/ GPRS/ Radio etc.</p>			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		<p>System should be kept in Protective Enclosure capable of giving vandalism alert and shall be SCADA compliant to the main control room operation including of all material, labour, lead, lift and all incidental charges.</p> <p>(This item shall be used for estimation purpose at DPR stage only. For estimation purpose the CCA in consideration has been suitably sub divided in 4800 ha boundaries beyond rising/ gravity mains. In case the total CCA under consideration is less than 5000/ 4800 ha the cost of RM/ GM shall deemed to be included in this item)</p> <p>Note: - Outlet point should be at centre and residual head with respect to highest level of Chak.</p>			
		Up to centre of 5.0 ha Chak			
	6.46.1	From 4800 to 300 ha Chak.	ha	69580.00	
	6.46.2	300 ha to 30 ha Chak.	ha	19940.00	
	6.46.3	30 ha to outlet to 5 ha (including Cost of SCADA, valves, bends, manifolds, controls, Outlet Management System, outlet with 5 manual valves at outlet with 10 times duty for at least 1 ha area i/c communications with PFCMD (pressure flow control metering device) control up to 5 ha)	ha	29030.00	
	6.46.4	5 ha to 1 ha with 10 times duty (including cost of valves, bends & manifolds. outlet with manual valve at one hectare i/c communications)	ha	28950.00	
6.47		Management, Operation and Maintenance (MOM) of existing pressurized irrigation Project with its complete distribution network by Pipeline covering Culturable Command Area (CCA).This work includes Management, Operation and Maintenance (including Preventive maintenance) of all Pumps &			

Item No.		Description of item	Unit	Rate	Remarks
1		2	3	4	5
		Motors, Control Panels, VFDs, valves for pump house ,filtration system, control room (including all accessories), Switch yard ,Transmission Lines , Rising Mains, Gravity Mains, Pipeline Valves, Air Valves, SCADA (from pump house up to OMS boxes), filling and operation of all Balancing Reservoirs/ Distribution Chamber/ Break Pressure Tank, all connecting roads (Bituminous, WBM, etc.), Residential & Non- residential Quarters & buildings, Pump House and SCADA Control rooms, Distribution network for complete CCA for distribution of water up to OMS box with designed discharge at field, removal and repair of illegal connections made by farmer in the distribution network ,including watch and ward of complete scheme (along with all the components of the project) round the year (during operational and non- operational period) as directed by the Engineer in-Charge. The work also includes testing and calibration of all electro-mechanical components before the start of irrigation period for MOM Period up to 5 years . NOTE: The above item is applicable for the projects which has recently achieved its O&M completion period for the first time.			
	6.47.1	For Sprinkler irrigation up to 1 ha Chak	Per ha/ year	1350.00	
	6.47.2	For Sprinkler irrigation up to 5 ha Chak	Per ha/ year	1250.00	
	6.47.3	For hose irrigation up to 1 ha Chak	Per ha/ year	950.00	
	6.47.4	For hose irrigation up to 5 ha Chak	Per ha/ year	900.00	

CHAPTER-7

TUNNEL AND ALLIED WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. The basic rates are inclusive of additional costs for working inside tunnel, shaft and audit and boomer.
3. The basic rates are inclusive of scaling loose material, removal of undercuts, cleaning bed including lighting and ventilation inside tunnel.
4. **Excavation:**
 - a) All the open cut excavation shall be measured and paid as per Chapter-4 “Canal and allied works”.
 - b) Sectional measurements shall normally be taken. Only in exceptional cases, where sectional measurements are not possible, the payment of rock excavation may be done by stack measurements in which case 40% deduction shall be made from the gross quantities to make allowance for voids.
 - c) The rates include dressing to the extent necessary for a particular item of work.
 - d) The payment for excavation shall be done as per pay line indicated in the drawing.
 - e) The payment for over break beyond pays line if beyond human control shall be:
 - i. 50% for excavation items; and
 - ii. 80% for concrete items.
5. Basic rates are inclusive of all lead and lifts.
6. Unless otherwise specified the basic rates are inclusive of standard finish required for concrete surface.
7. For excavation and concrete lining works of approach / exit channels the basic rates as provided under Chapter-4 “Canal and allied works” and Chapter-5 “Canal Structures” shall be adopted.
8. Rates for any other item, if required under Chapter-7 “Tunnel and allied works” may be adopted from other relevant chapters.
9. For intake structure, tunnel portals, retaining walls, pitching etc., the rates as provided under Chapter-3 “Dam and allied works” shall be adopted.
10. **Measurements:**
 - a) Linear dimensions shall be measured to the nearest 0.01 m, the area shall be worked out to the nearest 0.01 sqm and cubical contents to the nearest 0.01 cum.

- b) The measurement of permanent supports shall be done by weight in kg which shall include the total weight of steel sections including the logging, if any butt plates, feather plates, bolts and nuts and tie rods.
- c) No deduction shall be made for the volume of the reinforcement, but the volume of permanent steel supports where provided shall be deducted from the total volume of concrete lining.

Iron work: The rates include all labour and material that go into finished product such as-

- (a) Drilling, punching, fitting, cutting, bending, forging etc.,
- (b) All bolts, nuts, washer, plate, screws, rivets, cleats, wedges etc.
- (c) Fabrication, erection, finishing and fixing in position.

IS codes	Title
IS 4756-1978 (Reaffirmed 2007)	Safety Code for Tunnelling work (first revision)
	Code of practice for design of tunnels conveying water
IS 4880 (Part I)-1987	General design (Reaffirmed 1999)
IS 4880 (Part II)-1976	Geometric design (first revision) (Reaffirmed 2000)
IS 4880 (Part III)-1976	Hydraulic design (first revision) (Reaffirmed 2000)
IS 4880 (Part IV)-1971	Structural design of concrete lining in rock (Reaffirmed 2000)
IS 4880 (Part V)-1972	Structural design of concrete lining in soft strata and soils (Reaffirmed 2000).
IS 4880 (Part VI)-1971	Tunnel supports (Reaffirmed 2000)
IS 4880 (Part VII)-1975	Structural design of steel lining (Reaffirmed 2000)
	Code of practice for construction of tunnels-
IS 5878 (Part I)-1971	Precision survey and setting out (Reaffirmed 2000)
IS 5878 (Part II/Sec 1)-1970	Underground excavation in rock, section 1-Drilling and Blasting. (Reaffirmed 2000)
IS 5878 (Part II/Sec 2)-1971	Underground excavation in rock, section 2-Ventilation, lighting, Mucking and dewatering. (Reaffirmed 2000)
IS 5878 (Part II/Sec 3)-1971	Underground excavation in rock, section 3- Tunnelling method for steeply inclined tunnels, shafts and underground power houses. (Reaffirmed 2000)
IS 5878 (Part III)-1972	Underground excavation in soft strata (Reaffirmed 2000)
IS 5878 (Part IV)-1971	Tunnel supports (Reaffirmed 2000)
IS 5878 (Part V)-1976	Concrete lining (first revision) (Reaffirmed 2000)
IS 5878 (Part VI)-1975	Steel lining (Reaffirmed 2000)
IS 5878 (Part VII)-1972	Grouting (Reaffirmed 2000)
IS 6433-1972	Guniting equipment (Reaffirmed 2005)

CHAPTER -7
TUNNEL AND ALLIED WORKS
Schedule of Rates

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
7.01	7.01.1	Driving tunnel up to pay line, vertical/ inclined shaft, adit, recess, enlargement by tunnelling methods in rock not requiring permanent supports including cost of blasting, all materials, machinery, labour, ventilation, lighting, drainage, dewatering, scaling excavated surface, removing under cuts, removing and hauling excavated muck outside tunnel up to specified dump area and all other ancillary operations etc., complete with all underground and ground leads and lifts.	Cum	2127.00	
	7.01.2	Add extra rate in item no. 7.01.1 for using Boomer machine	Cum	800.00	
7.02	7.02.1	Driving of tunnel, up to pay line vertical/ inclined shaft, adit, recess, enlargement by tunnelling methods including excavation with supports in all types of soil/ rock strata requiring supports (excluding cost of providing supports) including cost of blasting, all materials, machinery, labour, ventilation, lighting, drainage, dewatering scaling excavated surface, removing and hauling excavated muck outside tunnel up to specified dump area and all other ancillary operations etc., complete with all underground and ground leads and lifts	Cum	3143.00	
	7.02.2	Add extra rate in item no. 7.02.1 for using Boomer machine	Cum	1000.00	
7.03		Dewatering and pumping of the working area in the tunnel including all connected operations of laying of pipeline, removal of all seepage and other operations required for maintaining cleanliness for construction work including all lead and lifts etc., complete.	Kwh	34.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
7.04		Providing 50 mm thick guniting/ shotcreting to sides and arch of tunnel in M25 proportion by weight including cost of all materials, machinery, labour, ventilation, lighting, drainage and all other ancillary operations including all lead and lifts etc., complete.	Sqm	806.00	
7.05		Providing and fixing 25 mm dia. steel rock bolts with one end provided with mechanical/ wedge type anchorage and other end provided with threads for fixing washers and nuts including cost of all materials, machinery, labour, ventilation, lighting, drainage, drilling 35-40 mm dia. holes, providing 150 mm long 20 mm thick steel tapered wedge, providing 10 mm thick and 200x200 mm size plate washer and nuts, driving bolt, fixing washers and nuts, tightening bolt by torque wrench after hardness of the cement grout and all other ancillary operations including all lead and lifts etc., complete.	M	1331.00	
7.06		Providing and fixing 25 mm diameter steel rock bolts with resin bond cement capsule anchorage including cost of all materials, machinery, labour, ventilation, lighting, drainage, drilling 35-40 mm dia. holes, threading one end of bolt for fixing nuts, inserting grout capsule, driving bolt, fixing 10 mm thick and 200x200 mm size plate washer and nuts, tightening the nuts by torque wrench after hardening of cement grout and all other ancillary operations including all lead and lifts etc., complete.	M	1327.00	
7.07		Providing fabrication and fixing in position permanent structural steel supports as per details including cost of all materials, machinery, labour, ventilation, lighting, drainage, drainage cutting, bending, welding, grinding and all other ancillary operations including all lead and lifts etc., complete.	Tonne	132885.00	
7.08		Providing and constructing un-coursed rubble stone masonry with approved stones from	Cum	3713.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		tunnel excavated muck in CM 1:6 proportion by volume for backfilling over cuts/ slips on tunnel sides due to geological faults etc., including cost of all materials, machinery, labour, ventilation, lighting, drainage, cleaning, scaffolding, batching and mixing mortar, packing mortar and wedging stone chips in joints, curing including all lead and lifts etc., complete.			
7.09	7.09.1	Providing and laying M20 grade design mix cement concrete using 40 mm graded aggregate, clean, hard, crushed from tunnel excavated rock for kerb and bed lining including cost of all materials, machinery, labour, ventilation, lighting, drainage, form work, batching and mixing concrete, conveying up to placing point in agitator cars, placing in position, levelling, vibrating, finishing, curing and all other ancillary operations including all lead and lifts etc., complete.	Cum	7006.00	
	7.09.2	Providing and laying M20 grade design mix cement concrete using 40 mm graded aggregate , clean, hard, crushed from tunnel excavated rock for sides and arch lining including cost of all materials, machinery, labour, ventilation, lighting, drainage, form work, rail mounted shuttering gantry, batching and mixing concrete, conveying up to placing point in agitator cars, placing in position using placer pump, levelling, vibrating, finishing, curing and all other ancillary operations including all lead and lifts etc., complete.	Cum	8182.00	
7.10		Drilling 35 to 40 mm diameter grout holes in concrete/ rock by percussion drilling using jack hammer or stopper drills as directed to specified depth for consolidation/ contact grouting including cost of all materials, machinery, labour, ventilation, lighting, drainage, dewatering cleaning holes and all other ancillary operations including all lead and	M	430.00	

Item No.		Description of Item	Unit	Rate	Remarks
1		2	3	4	
		lifts etc., complete.			
7.11		Grouting cement slurry in grout holes under specified pressure for consolidation/ contact grouting including cost of all materials, machinery, labour, ventilation, lighting, drainage, re-drilling wherever necessary, and all other ancillary operations including all lead and lifts etc., complete.	Tonne	211.00	
7.12		Drilling 50 to 75 mm diameter drainage holes vertical or inclined in rock/ concrete in tunnel by percussion drilling method using wagon drill or other suitable drilling equipment including cost of all materials, machinery, labour, ventilation, lighting, drainage including all lead and lifts etc., complete.	M	822.00	
7.13		Providing and applying of wire mesh 100X100X3.15 mm thick including all machineries, labours, cutting, placing. fixing, scaffolding, lighting, drainage, ventilation with providing and all other ancillary operation including all lead and lifts etc., complete	Sqm	780.00	

CHAPTER 8

GATE AND ALLIED WORKS

Instructions

1. General instruction on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour.
 - b) Running charges for machineries including fuel, lubricants and electricity charges etc., complete.
 - c) All materials, machineries and scaffoldings required for execution of items of work.
 - d) Packing and forwarding charges for structural steel components and other items including all lead and lifts.
 - e) Wastage of all raw materials such as steel, structural steel, nut bolts, paints etc.
 - f) All scaffolding's, form works, temporary electric arrangements etc.
 - g) Testing of materials, equipment's etc., in order to assure quality and safety measures.
 - h) Site clearance after all erection work, testing and trials etc.
 - i) All incidental charges.
 - j) Rehandling at fabrication and erection sites.
 - k) Preparation of designs / drawings / material schedules etc., as per specifications and other technical data including revisions.
 - l) Preparatory works such as rectification of damages, repairing, workshop/factory painting, cleaning, positioning and anchoring first stage embedment's, cleaning surface for field painting etc.
 - m) Zinc rich epoxy primer paint and coal tar epoxy paint, 40 microns per coat and 100 microns dry film thickness per coat respectively.
 - n) Design drawing @ 0.5% of item subject to maximum of Rs. 50,000.
3. The gates are classified on the basis of total head above sill level as follows:
 - a) High head gate- A gate which operates under a head of 30 m and above.
 - b) Medium head gate- A gate which operates under a head from 15 m to 30 m.
 - c) Low head gate - A gate which operates under a head of less than 15 m.

The gates shall be designed, taking into consideration the recommended design criteria and the materials used for different components shall conform to the relevant **IS Codes**.

Generally electromechanical hoist should be provided for spillway gates. However,

if the condition of frequent opening /shutting and urgent operation occurs, hydraulic hoist with prior written permission of **Chief Engineer (E&M)/Chief Engineer (BODHI)** and **Engineer-in-Chief Water Resources Department (C.G.)** may be obtained.

3.1 Canal gates of small size:

- a) The small gates shall be square or rectangular in shape. The size of square opening shall be 300, 450, 600, 750, 900, 1000 and 1200 mm and that for rectangular gate, recommended width to depth ratio is 1:0.75.
- b) The hoisting capacity and the diameter of the lifting rod shall be determined by taking into consideration the operating head under which the gate is to be closed. The type and capacity of the head stock and diameter of hand wheel should be sufficient to enable operation of gate under the maximum operating head. The manual operation arrangement shall be so designed that the continuous effort per person does not exceed a crank force of 100 N at 400 mm crank radius at a continuous rating of 24 revolution per minute, as per **IS 11228**.
- c) The exact length of lifting rod shall be determined considering distance from the bottom sill of gate to the top of operating platform, number of rods and guide brackets.
- d) The number of rods, guide brackets and number of rod couplings required shall be determined considering horizontal distance of water way opening.
- e) The materials used for different components is as specified below:

S.NO.	Component Part	Material	Specification
1	Head stock body, wedge, blocks guide brackets, thrust nut, stem coupling	Grey cast iron Grade20.	IS 210
2	Stem (spindle), Gate, frame shutter	Structural Steel	IS 2062
3	Stem nut	Cast brass	IS 28
4	Seating face (seat facings)	Stainless Steel	IS 410
5	Assembly bolts & nuts, wedge, clamping, adjustment bolts and nut.	Electro galvanized Mild steel	IS 1570:1961, IS 1367:1967
6	Anchor bolt	Mild steel	IS 1367
7	Paint gate	Epoxy paint	IS 14177
8	Paint for head-stock	Enamel paint	IS 14177

- f) The gates shall be workshop/factory tested. The leakage, if any, shall not exceed

1.5 liters per minute per meter length of sealing perimeter while testing under design hydraulic head conditions.

(A) Canal Gates (3 Meter Rod Length)

Size of Gate (in mm)	Rod Size (Spindle Dia.) (in mm)	Approximate weight (in Kg)
300 x 300	36	150
450 x 600	45	240
600 x 600	56	320
900 x 900	63	500

(B) Tank Gate (10 Meter Rod length) (Up to 15 meter water head)

Size of Gate (in mm)	Rod Size (Spindle Dia.) (in mm)	Approximate weight (in Kg)
300 x 300	36	180
450 x 450	45	275
600 x 600	56	400
750 x 750	63	410
900 x 900	63	550

Note: Approximate weights are shown for estimate purpose only. For payment, actual weight shall be considered.

4. **Painting work:** Paints, oils etc. of approved brand and manufacturer shall be used. Ready mixed paints as received from the manufacturer without any admixture shall be used. If for any reason, thinning is required in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as decided by the **Engineer-in-Charge** shall be used. Approved paints, oils shall be brought to the site of work by the contractor in their original container in sealed condition. The materials shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work.
 - a) No deduction shall be made for openings not exceeding 0.5 sqm each, and no addition shall be made for painting to beading, moulding, edges, jambs, soffits, sills etc., of such openings.
 - b) The surface preparation and painting of spillway, sluice, canal gates, stop log

gates and other components/ assemblies/ machineries /structures etc., exposed to water and exposed embedded parts should be done strictly in accordance to **IS 14177:1994**.

- c) Item 29 to 33 shall not be executed without prior approval of the **concerned Chief Engineer**. The time interval for painting of dams and Canals Gates etc., shall be normally five to seven years but if the condition of painting deteriorates on account of frequent operations of the opening and closing of gates in every season, the painting work can be taken up earlier also to save the gate and ancillary steel structure with the prior approval of **concerned Chief Engineer**.

5. **Measurements:**

- a) Dimensions shall be measured correctly to the nearest unit. The area shall be calculated in sqm correct to two places of decimal.
- b) For gates, structures, machineries etc., separate rates are worked out for works.
- i. Up to 1.5 m height.
 - ii. Beyond 1.5m height for item no 8.29, 8.30, 8.31, 8.32 & 8.33 etc. It is intended that the rates up to 1.5m height shall be payable where work is executed without the use of scaffolding etc. and the rates beyond 1.5 m height shall be payable where scaffolding etc., are used for the execution of the work. The measurement of height shall be taken from the skill level of gates, the place where component or job is executed e.g. ground level, deck, bridge etc.

6. The Calculation procedure of gate's weight for estimation purpose the following formulas maybe used.

Weight of 1 vertical lift gate excluding embedded parts in tonnes

$$= 0.1332 \times (L^2 \times H \times h)^{0.659}$$

(L) is length = clear vent width in m+0.50 m.

(H) is height of gate in m = clear vent height in m+0.20 m.

(h) is head of water above sill of gate in m = FSL – Sill level

Weight of 1 radial gate excluding embedded parts in tonnes

$$= 0.0887 \times (L^2 \times H \times h)^{0.673}$$

(L) is length in m = clear distance between piers.

(H) is total height of gate in m = FRL – Sill level +0.15 m.

(h) is head of water above sill of gate in m = FRL – Sill level

Weight of 1 set of vertical lift crest gate excluding embedded parts in tonnes

$$= 0.0690 \times (L^2 \times H \times h)^{0.716}$$

(L) is length = clear distance between piers in m+1 m.

(H) is total height of gate in m = FRL – Sill level +0.20 m.

(h) is head of water above sill of gate in m = FRL – Sill level

Weight of 1 set of Stop log elements excluding embedded parts in tonnes

$$= 0.0578 \times (L^2 \times H \times h)^{0.716}$$

(L) is length = clear distance between piers in m +0.65 m.

(H) is total height of stop log gate in m = FRL – Sill level +0.20 m

(h) is head of water above sill of gate in m = FRL – Sill level

Weight of Lifting beam in tonnes

$$= (0.02212 \times (L^2 \times H \times h)^{0.716})/n$$

(L) is length = clear distance between piers in m +0.65 m.

(H) is total height of stop log gate in m = FRL – Sill level +0.20 m

(h) is head of water above sill of gate in m = FRL – Sill level

(n) is number of gate elements in 1 set.

Capacity of screw hoist in tonne including 25% reserve capacity =2.50 x weight of gate (Hoist capacity shall be rounded off to next 1 tonne) Weight of screw hoist with all accessories: 300 kg per tonne capacity of hoist

Hoist capacity in tonne including 25% reserve capacity=2.5 x weight of gate (Hoist)

Capacity shall be rounded off to next 5 tonne

Weight of hoist with all accessories: 250 kg per tonne capacity of hoist.

Weight of hoist bridge:

Columns with bracing s/Anchors/Stiffeners: 400 kg per m height

Beams with cross beams/stiffeners: 400 kg per meter span

Railing/Chequerred plate/Ladder etc.: 10% of wt. of columns/beams

Weight of trunnion bridge: 300kg per meter length of catwalk

(Approximate weight - Vertical Axis swing gate is 0.50MT per sqm)

Weight of Embedded Parts to be taken

Gate Type	Ratio between weight of embedded parts and weight of gate		
	Minimum	Maximum	Mean
Spillway segment (Radial Gate)	0.09	0.21	0.13
Submerged segment	0.15	1.10	0.60
Fixed wheel with $B^2hH > 200m^4$	0.10	0.50	0.32
Fixed wheel with $B^2hH < 200m^4$	0.11	0.54	0.30
Spillway stop log	0.04	0.10	0.06
Submerged stop log	0.07	0.36	0.18
Flap gate	0.07	0.78	0.30

7. The gates shall be designed taking into consideration the recommended design criteria and the materials used for different components shall confirm to the relevant I.S.
8. Nominal sizes and Dimensions of single faced sluices shall be as specified below: -

S.No.	Shape	Size	Ref. to fig. As per table-2 page 26-67& fig. Page 26-93 to 26-97 of Sp. Vol.-IV
1	Circular	(a) 200 to 600 (b) 200 to 1200	4 A (1), 4 B (1) 4 C (1), 4 D (1)
2	Square	(a) 200 to 600 (b) 200 to 1200	4 A (2), 4 B (2) 4 C (2), 4 D (2)
3	Rectangular	300 x 375 to 1200 x 1050	4E

9. Approximate weight of canal and tank gates as per standard size, rod size and rod length shall be taken as below: -

(A) Canal Gates (1.5 Meter Rod Length).

Size of Gate (in mm)	Rod Size (Spindle Dia.)	Approximate weight (in Kg.)
300 x 300 mm	40 mm	150 Kg.
450 x 600 mm	48 mm	240 Kg.
600 x 600 mm	55 mm	320 Kg.
900 x 900 mm		500 Kg.

(B) Tank Gate (10 Meter Rod length) (Up to 15 meter water head)

Size of Gate (in mm)	Rod Size (Spindle Dia.)	Approximate weight (in Kg.)
300 x 300	40 mm	180 Kg.
450 x 450	48 mm	275 Kg.
600 x 600	55 mm	400 Kg.
750 x 750	58 mm	410 Kg.
900 x 900	60 mm	550 Kg.

(C) Weight of Automatic Outflow Regulating Gate

Size of Gate	Approximate weight per sqm (in Tonne)
(i) 1 to 10 sqm	1.20 Tonne
(ii) 10 to 20 sqm	1.40 Tonne
(iii) 20 to 50 sqm	1.80 Tonne
(iv) 50 to 75 sqm	2.00 Tonne

(D) Weight of 1 vertical lift gate including embedded parts in tones

$$= 0.1332 \times (L^2 \times H \times h)^{0.659}$$

(L) is length = Clear vent width in m+ 0.50 m.

(H) is height of gate in m = Clear vent height in m+0.20 m

(h) is head of water of water above sill of gate in m = FSL - Sill level

(E) Weight of 1 radial gate including embedded parts in tones = $0.0887 \times (L^2 \times H \times h)^{0.673}$

(L) is length in m = Clear distance between piers.

(H) is total height of gate in m = FRL - Sill level + 0.15 m

(h) is head of water above sill of gate in m = FRL - Sill level

(F) Weight of 1 set of vertical lift crest gate including embedded parts in tones

$$= 0.0690 (L^2 \times H \times h)^{0.716}$$

(L) is length = Clear distance between piers in m+1 m.

(H) is total height of gate in m = FRL - Sill level + 0.20 m

(h) is head of water above sill of gate in m = FRL - Sill level

(G) Weight of 1 set Stoplog elements including embedded parts in

$$\text{tones} = 0.0578 (L^2 \times H \times h)^{0.716}$$

(L) is length = Clear distance between piers + 0.65 m

(H) is total height of stoplog gate in m = FRL - Sill level + 0.20 m

(h) is head of water above sill of gate in m = FRL - Sill level

(H) Weight of lifting beam in tones = $0.02212 \times (L^2 \times H \times h)^{0.716}/n$

(L) is length = Clear distance between piers + 0.65 m.

(H) is total height of stoplog get in m = FRL - Sill level + 0.20 m

(h) is head of water above sill of gate in m = FRL - Sill level

(n) is number of gate elements in 1 set

(I) Capacity of screw hoist in tone including 25% reserve capacity = $2.50 \times \text{Wt. of gate}$ (Hoist capacity shall be rounded off to next 1 tonne)

Weight of screw hoist with all accessories: 300 kg per tonne capacity of hoist.

(J) Hoist Capacity in tonne including 25% reserve capacity = $2.5 \times \text{Weight of gate}$ (Hoist

capacity shall be rounded off to next 5 tonne)

Weight of hoist with all accessories: 250 kg per tonne capacity of hoist.

(K) Weight of hoist bridge:

Columns with bracings / Anchors / Stiffeners: 400 kg per meter

height. Beams with cross beams / stiffeners: 400 kg per meter span.

Railing / Chequered plate / Ladder etc.: 10% of wt. of columns/beams

(L) Weight of trunnion bridge: 300 kg per meter length of catwalk.

(M) Approximate weight of item no. 2602 (d) i.e. Vertical Axis swing gate is 0.50 MT per sqm.

10. Item no. 2602 (a) and 2607 (b) is protected under Indian patent act 1970 vide no. 183493 and 189015 respectively and tenderer should ask to produce license for manufacture and erection and consent letter for technical services from the patent holder/assignee on his own cost.

11. **The following Indian Standards, may be referred to: -**

IS Codes	Title
IS 104:1979	Ready Mixed Paint, Brushing, Zinc Chrome, Priming (Second Revision). (With Amendment No. 1) (Reaffirmed 2004).
IS 210:1993	Specifications for Grey Iron Casting (Reaffirmed In 1999)
IS 226:1975	Specifications for Structural Steel (Standard Quality) (Super-Ceded by IS 2062:1992) 5th Revision
IS 306:1983	Specifications for Bronze in Gates and Castings (Reaffirmed in 1998)
IS 318:1981	Specifications for Loaded Tin Bronze and Casting (Reaffirmed in 2001):
IS 290:1961	Coal Tar Black Paint (Revised) (Reaffirmed 1996)
IS 430:1972	Paint Remover, Solvent Type, Non-Flammable (Second Revision) (Reaffirmed 1999)
IS 800:1984	Code of Practice for General Construction in Steel in General Building Construction (Reaffirmed In 2007)
IS 800:1973 (Part III, V & VI)	Specifications for Rolled Steel Beam, Channel and Angle Sections (Revised in 1989)
IS 816:1969	Code of Practice for use of Metal Arc Welding for General Construction in Mild Steel (Reaffirmed in 1998)
IS 817:1987	Code of Practice for Straining and Testing of Metal Arc Welders (Reaffirmed in 2003)
IS 819:1957	Code of Practice for Resistance Spot Welding for Light Assemblies in Mild Steel (Reaffirmed in 1998)
IS 822:1970	Code of Practice for Inspections of Welds. (Reaffirmed in 2003)
IS 823:1964	Code of Practice of Metal Arc Welding of Mild Steel.

IS 1024:1999	Code of Practice for use of Welding in Bridges and Structures, Subject to Dynamic Loading.
IS 1030:1998	Carbon Steel Castings for General Engineering Purposes
IS 1068:1993	Electroplated Castings of Nickle and Chromium Iron and Steel (Reaffirmed in 2006)
IS 1181:1967	Qualifying Test for Metal Arc Welders. (Superseded by 7318: 1974)
IS 1323:1982	Code of Practice for Oxygen-Acetylene Welding for Structural Work in Mild Steel. (Reaffirmed in 2003)
IS 1393:1961	Code of Practice for Training and Testing of Oxygen- Acetylene Welding (Reaffirmed in 2003)
IS 1570:1978	(Part-VII) Schedule for Wrought Steel for General Engineering Purposes (Reaffirmed in 1998)
IS 2004:1991	Specifications for Steel Forgings for General Engineering Purposes.
IS 2062:1999	Specifications for Structural Steel. (Fusion Welding Quality) (Revised in 2006)
IS 2595:1978	Code of Practice for Radiographic Testing. (Reaffirmed in 2000)
IS 2825:1969	Code of Practice for Stress Relieving of Welding Joints (Reaffirmed in 2002)
IS 3042:1965	Specifications for Single Faced Sluice Gates (200 mm to 1200 mm size) (Reaffirmed in 2003)
IS 4622:2003	Recommendations For Structural Design of Fixed Wheel Gates (Reaffirmed in 2013)
IS 4623:2000	Recommendations For Structural Design of Radial Gates. (III rd Revision) (Reaffirmed in 2013)
IS 5905:1989	Specifications for Sprayed Aluminum and Zinc Coating on Iron and Steel. (Reaffirmed in 2000)
IS 6527:1995	Specifications for Stainless Steel Wire Rod (Reaffirmed 2006).
IS 6603:2001	Specifications for Stainless Steel Bars and Flats
IS 6938:2005	Code Of Practice for Design and Rope Drum and Chain Hoists for Hydraulic Gates (With Amendment 2) (Reaffirmed in 2010)
IS 7718 (Part 1):1991	Recommendations for Inspection, Testing and Maintenance of Fixed Wheel Slide Gates at Manufacturing Stage. (Revised in 1991) (Reaffirmed in 2010)
IS 7718 (Part11):1978	Recommendations for Inspection, Testing and Maintenance of Fixed Wheel Slide Gates- At the Time of Erection. (Revised in 1991)
IS7718(Part III):1978	Recommendations for Inspection, Testing and Maintenance of Fixed Wheel Slide Gates - After Erection. (Revised in 1991)
IS 8500:1991	Structural Steel Micro Alloyed (Medium and High Strength Qualities) (Reaffirmed in 2000)

IS 9349:2006	Recommendations for Structural Design of Medium and High Head Slide Gates. (II nd Revision)
IS 10096 (Part I, Sec.1):1983	Recommendations for Inspection, Testing, Maintenance of Radial Gates and their Hoists at Manufacturing Stage. (Revised in 1983 and reaffirmed in 1990)
IS 10096 (Part I):1983	Inspection, Testing and Assembly at the Manufacturing Stage Section-I Gates. (Reaffirmed 2000) Section-2- Rope Drum Hoists - (Reaffirmed 2000)
IS 10096 (Part II):1983	Inspection, Testing and Assembly at the time of Erection (Reaffirmed 2000)
IS 10096 (Part III): 2002	Recommendations for Inspection, Testing, Maintenance of Radial Gates and their Hoists- After Erection. British Steel Corp. Corrosion Prevention Booklet No. 5.
IS 10210:1993	Criteria for Design of Hydraulic Hoist for Gates (First Revision)
IS 14177:1994	Guidelines for Painting System for Hydraulic Gates and Hoists.

CHAPTER -8

GATE AND ALLIED WORKS

Schedule of Rates

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.01		Design, Drawing, fabrication, supply, erection, testing and commissioning of Embedded parts consisting of sill beam, vertical tracks, vertical seal tracks, sealing frame, Guide tracks/rails, wall plates, Liner Plate, seal seats, anchors, anchor girders, yoke girders, tie flats, trunnion supports, rope and pulley supports etc. and any required necessary item , with all accessories as per relevant IS code, for all type Radial gates/ Vertical lift fix wheel type sluice and Canal gates/Stop log gates including cost of all materials, machinery, labour, cutting, aligning, anchoring, welding, finishing, cleaning, tools and tackles, applying two coat of zinc rich epoxy primer to give dry film thickness of 70 ± 5 microns and finish coat(two coats)of solvent less coal tar epoxy paint using airless spray to provide dry film thickness of 150 ± 5 microns per coat thus total dry film thickness of all coats, including primer coating, should not be less than 350 microns., including packing & forwarding, transportation charges complete item, as per specifications and approved drawings including all lead and lifts	Tonne	187322.00	
8.02		Design, Drawing, fabrication, supply, erection, testing and commissioning of Radial gate consisting of skin plate, stiffeners, horizontal girders, sector arms, trunnion assemblies, tie beam, pulley supports, bracings, rubber seals, clamps plates etc., with all accessories as per relevant IS code for Radial gates including cost of all materials, machinery, labour, cutting, bending, aligning, anchoring, welding, finishing, cleaning, tools and tackles, applying two coat of zinc rich epoxy primer to give dry film thickness of 70 ± 5 microns and finish coat(two coats)of solvent less coal tar epoxy paint using airless spray to provide dry film thickness of 150 ± 5 microns per coat thus total dry film thickness of	Tonne	182036.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		all coats, including primer coating, should not be less than 350 microns., seal fixing etc., complete as per specifications and approved drawings complete, including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.			
8.03		Design, Drawing, fabrication, supply, erection, testing and commissioning of Vertical lift fix wheel type sliding gate/inter changeable Stop log gates consisting of skin plate, stiffeners, horizontal girders, pulley, pulley supports, bracings, lifting lug, bracket, rubber seals, clamps plates etc., with all accessories as per relevant for Canal , sluice Vertical gates and spillway gates including cost of all materials, machinery, labour, cutting, bending, aligning, anchoring, welding, seal fixing, tools and tackles etc., finishing, cleaning, applying two coat of zinc rich epoxy primer to give dry film thickness of 70± 5 microns and finish coat(two coats)of solvent less coal tar epoxy paint using airless spray to provide dry film thickness of 150± 5 microns per coat thus total dry film thickness of all coats, including primer coating, should not be less than 350 microns., complete as per specifications and approved drawings complete, including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.	Tonne	186025.00	
8.04		Design, Drawing, fabrication, supply, erection, testing and commissioning of Vertical lift sliding type gate with frame consisting of skin plate, sealing frame, stiffeners, horizontal and vertical girders, guide, stainless steel flat/Brass flat, rivets, wedges, lifting rods etc., with all accessories as per relevant IS code including frame & gate complete set for Canal Cross, Escape, Head regulator /Tank head regulator ,Barrage/Stop dam/Anicut/waste weir /spillway including cost of all materials, machinery, labour, cutting, aligning, welding, finishing, cleaning, seal fixing, tools and tackles etc., applying two	Tonne	208042.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		coat of zinc rich epoxy primer to give dry film thickness of 70± 5 microns and finish coat(two coats)of solvent less coal tar epoxy paint using airless spray to provide dry film thickness of 150± 5 microns per coat thus total dry film thickness of all coats, including primer coating, should not be less than 350 microns., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.			
8.05		Design, Drawing, fabrication, supply, erection, testing and commissioning of Adequate capacity electrically operated rope drum hoist according to relevant IS code , rope drums, connecting shaft, gear system, Reduction gear unit, electric motor, electro- magnetic brake system, control panel, pulleys, wire rope, gate position indicator, limit switch with inbuilt manual operating system, etc. complete, with all accessories for operating gates including cost of all materials, machinery, labour, cutting, aligning, anchoring, welding, finishing, cleaning, greasing, oil filling, tools and tackles, applying two coats of zinc chromate red oxide primer and three coats of approved synthetic enamel paint etc., complete as per specifications and approved drawings , including packing & forwarding, transportation charges for all materials, including all lead and lifts.	Per tonne capacity	66910.00	
8.06		Design, Drawing, fabrication, supply, erection, testing and commissioning of Adequate capacity manually operated rope drum hoist according to relevant IS code, consisting of rope drums, connecting shaft, gear system unit, pulleys, wire rope, Gate position indicator, manual operation system, etc. complete, with all accessories for operating gates including cost of all materials, machinery, labour, cutting, aligning, anchoring, welding, finishing, cleaning, greasing, oil filling, tools and tackles, applying two coats of zinc chromate red oxide primer and three coats of approved synthetic enamel paint etc., complete as per specifications and approved drawings,	Per tonne capacity	58765.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		including packing & forwarding, transportation charges for all materials, including all lead and lifts.			
8.07		Design, Drawing, fabrication, supply, erection, testing and commissioning of Adequate capacity manually operated screw type hoist according to relevant IS code, consisting of supporting structure, platform bridge etc., operating handle ,gate position indicator, plumber block, couplings with all required accessories for operating Head/cross/ escape regulator gate including cost of all materials, machinery, labour, tools and tackle, cutting, aligning, anchoring, welding, finishing, cleaning, greasing, oiling, applying two coats of zinc chromate red oxide primer and three coats of approved synthetic enamel paint etc. complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation charges for structural steel components and other materials.	Per tonne capacity	48800.00	
8.08		Design, Drawing, fabrication, supply, erection, testing and commissioning of Adequate capacity Electrically operated screw type hoist according to relevant IS code, consisting of supporting structure, platform bridge etc., operating handle ,gate position indicator, plumber block couplings motor reduction gear unit, limit switch, control panel cables with inbuilt manually operation with all required accessories for operating Head/cross/ escape regulator gate including cost of all materials, machinery labour tools and tackle cutting, aligning, anchoring, welding, finishing, cleaning, greasing, oiling, applying two coats of zinc chromate red oxide primer and three coats of approved synthetic enamel paint etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation charges for all materials.	Per tonne capacity	52137.00	
8.09		Design, Drawing, fabrication, supply, erection, testing and commissioning of adequate capacity Moving Gantry Crane according to relevant IS	Per tonne capacity	307654.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		code consisting of rail mounted gantry frame, top platform with handling long/cross travel arrangements ,rope drums, gear systems, rails, electric motors, electromagnetic brake system, operator and pannel cabin, control panel, wire rope , ladder, motorized cable reeling drum, suitable counter weight etc. with all accessories for Operating stop log gates elements including cost of all materials, machinery, tools and tackles, labour, aligning, anchoring, welding, cleaning, greasing, applying two coats of zinc chromate red oxide primer three coats of approved synthetic enamel paint etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation, charges for all materials.			
8.10		Design, Drawing, fabrication, supply, erection, testing and commissioning of Automatic lifting beam with all accessories ,like automatic detach/attach system, hooks/rollers, guides, pins complete for handling, lowering and lifting of Stop log/ emergency gates including cost of all materials, machinery, tools and tackles, labour, cutting, aligning, welding, finishing, cleaning, applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint etc., complete as per specifications and approved drawings, including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.	Tonne	221941.00	
8.11		Design, Drawing, fabrication, supply, erection and commissioning of Trestle assembly/ Railing decking/Trash rack/Structural steel hoist bridge/ structural steel hoist supporting structure for monorail /Catwalk bridge for connecting spillway piers for all type of sluice with embedded parts consisting of columns, beams, bracings, stiffeners, ties, chequered plate covering, hand railing, ladder etc., with all other accessories for operating gates, other structure including cost of all materials, machinery, labour, tools and	Tonne	161144.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		tackles, cutting, aligning, anchoring, welding, finishing, cleaning, applying two coats of zinc chromate red oxide primer and three coats of approved synthetic enamel paint etc., complete as per specifications and approved drawings , including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.			
8.12		Design, fabrication, supply, erection and commissioning of adequate capacity Electrically operated mono-rail hoist assembly consisting of electric motor, rope drum, gear system, wire rope with lifting attachment, Monorail long beam, equalizer idle pulleys, festoon cabling, control panel etc., with all accessories for operating pump house stop-log gate including cost of all materials (excluding only hoisting supporting trestle column structure), machinery, labour, cleaning, greasing etc., complete as per specifications and approved drawings , including packing & forwarding transportation charges for structural steel components and other materials, including all lead and lifts.	Per tonne capacity	76914.00	
8.13		Design, Drawing, fabrication, supply, erection, testing and commissioning of EOT crane consisting of double girder box type construction, rail mounted end carriages with long and cross travel arrangement, main and auxiliary hoists of specified capacity, rails, pendant control, gear boxes, electric motors, brakes, rope drums, wire ropes, sheaves, end buffer stoppers, pendant operated DSL bus bars with all accessories for main and auxiliary hoists for handling pumps and accessories in pump house including cost of all materials, machinery, labour, cutting, aligning, welding, finishing, cleaning, greasing, applying two coats of zinc chromate red oxide primer and three coats of synthetic enamel paint etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.	Per tonne capacity	153827.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.14		Design, Drawing, fabrication, supply, erection, testing and commissioning of Hydraulic Hoist for Spill way, Head Sluice & other Regulating gates, with all accessories like Power Pack, duly filled with oil, Hydraulic cylinder, Hydraulic cylinder pipe line, Limit Switch, Dial indicator panel, Cable, Control panel etc. including cost of all materials, machinery, labour, cutting, aligning, welding, finishing, cleaning, greasing, applying two coats of zinc chromate red oxide primer and three coats of synthetic enamel paint etc. With all scope of work, complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.	Per tonne capacity	108670.00	
8.15		Design, Drawing, fabrication, supply, erection, testing and commissioning of Rail track using 45 kg /52 kg/60 kg/ m standard rails on bridge with base plate , anchors, nut bolts , fasteners etc. as required for movement of gantry crane for handling and operating stop log gate elements including cost of all materials, machinery, labour, aligning, anchoring, welding, cleaning, applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint for buffers and rail supporting plates etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for all materials.	Kg	149.00	
8.16		Providing fabrication and fitting work of Stainless steel flat on Embedded parts (on Departmental section, only MS section Given by department) of gates with testing , including cost of all materials(SS flat and welding rods etc.), machinery, tools and tackles, labour, cutting, aligning, welding, finishing, cleaning, applying two coat of cement primer etc., complete as per specifications and approved drawings, including packing & forwarding, transportation charges for structural steel components and other materials, including all lead and lifts.	Kg	649.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.17		Providing Casting machining and assembling of Cast Steel Rollers assembly complete with testing ,including cost of all materials as cast steel rollers, stainless steel eccentric pin/shaft with square cut shape in one end for adjustment, lock plate, bronze bush, cover plate ,nut bolts, machinery, labour, cutting, aligning, welding, finishing, cleaning, applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint, etc., complete as per specifications and approved drawings with all lead and lifts, tools and tackles, including packing & forwarding, transportation charges for structural steel components and other materials.	Kg	370.00	
8.18		Providing Casting ,dressing and assembling of Cast Iron Ballast weight assembly complete as per drawing with testing ,including cost of all materials as cast iron ballast weight , suitable type tapped threaded hole with nut hook for lifting in all sides, with machinery, labour, cutting, aligning, welding, finishing, cleaning, etc. ,complete as per specifications and approved drawings with all lead and lifts, tools and tackles including packing & forwarding transportation charges for structural steel components and other materials.	Kg	123.00	
8.19		Providing Casting machining and assembling of Cast Iron Items for Tank, canal, barrage, stop dam gates as CI wedges with suitable L-end key nut bolts, CI couplings, CI guides, assembly complete as per drawing with testing ,including cost of all materials, with machinery, labour, cutting, aligning, welding, finishing, cleaning, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.			
		(a) CI wedges	Kg	210.00	
		(b) CI couplings, Guides, etc.	Kg	229.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.20		Providing Fabrication, machining and assembling of different types of MS Anchors/MS Anchors/MS chuck nut for Gates assembly, complete as per drawing with testing ,including cost of all materials, applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint with machinery, labour, cutting, aligning, welding, finishing, cleaning, etc. ,complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.			
		a) MS Chuck Nut	Kg	239.00	
		a) U, J, H, I type anchors	Kg	141.00	
		b) Anchor bolts with two nut and two washers	Kg	167.00	
8.21		Providing Casting machining and assembling of Head stocks assembly with handle complete for operating tank, canal, barrage, stop dam gates , as per drawing with testing ,including cost of all materials as head stock body, GM nut, worm wheel gear bush ,pin ,operating handle etc. with machinery, labour, cutting, aligning, welding, finishing, cleaning, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.			
		a) Head Stock worm & wheel type, coupled set 63mmdia. /56mm dia. (Model WW-90) two tonne capacity, approx. 322 kg	Kg	263.00	
		b) Head Stock worm & wheel type, single set, 63mm dia./56mm dia. (Model WW-90) one tonne capacity -- -approx-175 kg	Kg	229.00	
		c) Head Stock screw jack type,50mmdia. . threaded nut (model M-75),0.750 tonne capacity approx.- 45 kg	Kg	176.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		d) Head Stock screw jack type, 45mmdia. . threaded nut (model M-70),0.700 tonne capacity---- approx-42 kg	Kg	165.00	
		e) Head Stock screw jack type, 36mmdia. . threaded nut (model S-36),0.400 tonne capacity approx.- 19.5 kg	Kg	235.00	
8.22		Straightening and machining work of structural steel sections (departmental materials) complete job, with all machinery as planner machine etc., labour, cutting, aligning, finishing, cleaning, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.			
		(a)Straightening work any steel sections	Kg	4.00	
		(b)Machining work of structural steel sections like as Guide Track etc. with planner machine	Sqm	2500.00	
8.23		Providing, fabrication, threading (Square and V threading as required), machining, straightening of MS Round bar complete as per drawing with testing, including cost of all materials, with machinery, labour, cutting, aligning, welding, finishing, cleaning, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding transportation charges for structural steel components and other materials.			
		(a)Rate for double start square threading for 63mm dia. round bar with materials	Kg	176.00	
		(b)Rate for double start square threading for 63mm dia. round bar without materials	M	1923.00	
		(c)Rate for single start square threading for 63mm dia. round bar with materials	Kg	167.00	
		(d) Rate for single start square threading for	M	1830.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		63mm dia. round bar without materials			
		(e)Rate for double start square threading for 56mm dia. round bar with materials	Kg	161.00	
		(f) Rate for double start square threading for 56mm dia. round bar without materials	M	1315.00	
		(g) Rate for single start square threading for 56mm dia./50mmdia. /45mm dia. round bar with materials	Kg	177.00	
		(h)Rate for single start square threading for 56mm dia./50mmdia. /45mm dia. round bar without materials	M	1264.00	
		(i) Rate for single start square threading for 36mm dia./32mmdia. round bar with materials	Kg	156.00	
		(j) Rate for single start square threading for 36mm dia./ 32mmdia. round bar without materials	M	469.00	
		(k) Rate for "V " threading for round bar with materials			
		i)63mmdia.	Kg	158.00	
		ii)56mmdia.	Kg	150.00	
		iii)50 mm dia.	Kg	145.00	
		iv)45mmdia.	Kg	159.00	
		v)36mm dia.	Kg	140.00	
		vi)32mm dia.	Kg	140.00	
		(L)Rate for "V "threading for round bar without materials			
		i)63mmdia.	M	1731.00	
		ii)56mmdia.	M	1647.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		iii)50 mm dia.	M	1184.00	
		iv)45mmdia.	M	1138.00	
		v)36mm dia.	M	422.00	
		vi)32mm dia.	M	422.00	
8.24		Providing, Fabrication, machining with straightening work of Guide Tee, Track, Sealing frame, Leaf frame, skin plate, lifting rod, Hoisting assembly or any part of gate's, complete as per drawing with testing, including cost of all materials, with machinery, labour ,tools and tackles cutting, aligning, welding, finishing, cleaning, etc., applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation charges for structural steel components and other materials.			
		(a) Rate of work with all materials	Kg	142.00	
		(b) Rate of work without materials	Kg	34.00	
8.25		Erection work of fabricated gates ,any parts of gate's and any accessories of gate's, complete as per drawing with testing ,including cost of all materials required for completing the job like welding rods, tools tackles etc., with machinery, labour, tools and tackles cutting, aligning, welding, finishing, cleaning, etc., applying one coat of zinc rich epoxy primer and two coats of cold applied coal tar epoxy paint, etc., complete as per specifications and approved drawings with all lead and lifts, including packing & forwarding, transportation charges for structural steel components and other materials.	Kg	30.00	
8.26		Providing of MS Nut Bolts of required size and type, as per specifications with testing, including all lead and lifts, packing & forwarding	Kg	172.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		transportation charges for all components.			
8.27		Providing of High tensile MS Nut Bolts of required size and type, as per specifications with testing, including all lead and lifts, packing & forwarding transportation charges for all components.	Kg	229.00	
8.28		Providing of Stainless steel counter shunk nut bolts with washer of required size and type, as per specifications with testing, including all lead and lifts, packing & forwarding transportation charges for all components.	Kg	551.00	
8.29		Providing of Rubber seals as per IS 11855 for Dam sluice, canal, barrage, stop dam etc. gates of required size and type and specifications with testing, including all lead and lifts, packing & forwarding transportation charges for all components.			
		a) Rubber seal musical note type 75mm x33mm x12mm (33mm Bulb) uncladded	M	700.00	
		b) Rubber seal musical note type 75mm x33mm x12mm (33mm Bulb) Teflon cladded	M	1895.00	
		c) Rubber seal musical note type 100mm x44mm x14mm (44mm Bulb) uncladded	M	950.00	
		d) Rubber seal musical note type 100mm x44mm x14mm (44mm Bulb) Teflon cladded	M	2100.00	
		e) Rubber seal Z type 100mm x55mm x25mmx20mm (L-55mm/25mm) uncladded	M	1406.00	
		f) Rubber seal Z type 120mm x75mm x35mmx20mm (L-75mm/35mm) uncladded	M	1500.00	
		g) Rubber seal Z type 150mm x75mm x35mmx20mm (L-75mm/35mm) uncladded	M	1700.00	
		h) Rubber seal Flite type 75mm 12mm uncladded	M	353.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		i)Rubber seal Flite type 100mm x14mm uncladded	M	556.00	
		j) Rubber seal Flite type 150mm x20mm uncladded	M	1120.00	
		k) Rubber seal Corners musical note type 100mm x44mm x14mm (44mm bulb), Teflon cladded inside bulb or outside bulb 300mm x300mm long, set of two pieces	M	3640.00	
		l)Rubber seal Corners musical note type 100mm x44mm x14mm (44mm bulb), un cladded inside bulb or outside bulb 300mm x300mm long, set of two pieces	M	1900.00	
8.29 (a)		Erection Charges for item no. 8.29 including removing of old rubber seal wherever required.		15% of items in 8.29	
8.30		Painting of Spillway gates, sluice gates, canal gates (both vertical or Radial),stoplog gates, exposed embedded parts and all unmachined ferrous surface(hoist cylinders, cylinder heads, hydraulic piping, pipe fittings, bonnet covers), exposed to water as per IS 14177,for which surface preparation by blast cleaning of class" primer coat (one coat) of inorganic zinc silicate (preferably airless spray)or alternatively, two coats of zinc rich primer(containing not less than 85% zinc on dry film) to give dry film thickness of 70 ± 5 micron and finish coat (two coats) of solvent less coal tar epoxy paint using airless spray to provide dry film thickness of 150 ± 5 micron per coats. Thus, total dry film thickness of all the coats, including primer coating, should not be less than 350 microns, this will be including expenses on mobilisation and demobilisation of equipment's. For maintenance painting the surface preparation shall be done by appropriate hand and power tool cleaning, prior to hand power tool cleaning. any heavy layer of rust should be removed by chipping visible oil, grease, dirt and other foreign material be cleaned using solvents like clean mineral spirits,			

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		xytol or white gasoline. After hand and power tool cleaning the surface should be cleaned of loose dust and debris and/or blast cleaned as laid down in para 7.0 of IS code 14177. After the surface preparation the primer and finishing coats shall be carried out as provided above for painting			
		a) Up to 1.5m height	Sqm	659.00	
		b) Beyond 1.5 m height	Sqm	692.00	
8.31		Painting of lifting beam/lifting tackles are per IS 14177, for which surface preparation by blast cleaning, as per class "C" or class "B", primer coat (two coats) of zinc Phosphate primer, to provide dry film thickness of 40 microns per coat and finish coat (two coats) of alkyd based micaceous iron oxide paint, using airless spray, to provide minimum dry film thickness of 65± 5 microns per coat, at an interval of 24 hours. Thus, total dry film thickness of all the coats, including primer coating, should not be less than 200 microns. This will include expenses on mobilisation and demobilisation of equipments. For maintenance painting, the surface preparation shall be done by appropriate hand and power tool cleaning. Prior to hand and power tool cleaning, any heavy layer of rust should be removed by chipping. Visible oil, grease, dirt and other foreign material be cleaned using solvents like clean mineral spirits, xytol or white gasoline. After hand and power tool cleaning, the surface should be cleaned of loose dust and debris and / or blast cleaned as laid down in para 7.0 of IS Code 14177. After the surface preparation, the primer and finishing coats shall be carried out as provided above for painting			
		a) Up to 1.5m height	Sqm	582.00	
		b) Beyond 1.5m height	Sqm	612.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.32		Painting of structural components of Hoist including supporting structures and surfaces of hydraulic hoist sun exposed to water as per IS:14177, for which surface preparation by blast cleaning of class 'B', primer coat (two coats) of Zinc phosphate primer to give dry film thickness of 40 ± 5 microns per coat and finish coat (one coat) of alkyd based micaceous iron oxide paint give dry film thickness of 65 ± 5 microns followed by two coats of synthetic enamel paint, using airless spray, to give dry film thickness of 25 ± 5 microns per coat, at an interval of 24 hours. Thus, total dry film thickness of all the coats, including primer coating, should not be less than 175 microns. This will include expenses on mobilisation and demobilization of equipment's. For maintenance painting, the surface preparation shall be done by appropriate hand and power tool cleaning. Prior to hand and power tool cleaning, any heavy layer of rust should be removed by chipping.			
		Visible oil, grease, dirt and other foreign material be cleaned using solvents like clean mineral spirits, xylol or white gasoline. After hand and power tool cleaning, the surface should be cleaned of loose dust and debris and / or blast cleaned as laid down in para 7.0 of IS Code 14177. After the surface preparation, the primer and finishing coats shall be carried out as provided above for painting.			
		a) Up to 1.5m height	Sqm	566.00	
		b) Beyond 1.5m height	Sqm	595.00	
8.33		Painting of machinery, including gearing, housing, shafting, bearing, pedestals, oil tanks, control cabinets, hoist beams, pipe support, clamps, ladders etc., of hoists and supporting structures, as per IS 14177, for which surface preparation by blast cleaning of class 'B', primer coat (one coat) of Zinc phosphate paint to give a minimum dry film thickness of 50 ± 5 microns and finish coat (three coats) of aluminum paint or			

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		synthetic enamel paint, using airless spray, to provide a dry film thickness of 25 ± 5 microns per coat. Thus, total dry film thickness of all the coats, including primer coat, should not be less than 125 microns. This will include expenses on mobilisation and demobilisation of equipment's. For maintenance painting, the surface preparation shall be done by appropriate hand and power tool cleaning. Prior to hand and power tool cleaning, any heavy layer of rust should be removed by chipping.			
		Visible oil, grease, dirt and other foreign material be cleaned using solvents like clean mineral spirits, xylol or white gasoline. After hand and power too cleaning, the surface should be cleaned of loose dust and debris and / or blast cleaned as laid down in para 7.0 of IS Code14177. After the surface preparation, the primer and finishing coats shall be carried out as provided above for painting			
		a) Up to 1.5m height	Sqm	434.00	
		b) Beyond 1.5m height	Sqm	456.00	
8.34		Painting of unmachined surface, as per IS 14177, for which surface preparation by blast cleaning of class 'B', primer coat (one coat) of chlorinated rubber based zinc phosphate primer, to provide a dry film thickness of 50 ± 5 microns and finish coat (three coats) of vinyl resin /chlorinated rubber, using airless spray, to provide a dry film thickness of 30 ± 5 microns per coat. Thus, total dry film thickness of all coasts including primer coat should not be less than 125 microns. Thus, will include expenses on mobilisation and demobilisation of equipment's.; For maintenance painting, the surface preparation shall be done by appropriate hand and power tool cleaning. Prior to hand and power tool cleaning, any heavy layer of rust should be removed by chipping.			

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
	s	Visible oil, grease, dirt and other foreign material be cleaned using solvents like clean mineral spirits, xylol or white gasoline. After hand and power tool cleaning, the surface should be cleaned of loose dust and debris and / or blast cleaned as laid down in para 7.0 of IS Code14177. After the surface preparation, the primer and finishing coats shall be carried out as provided above for painting			
		a) Up to 1.5m height	Sqm	616.00	
		b) Beyond 1.5m height	Sqm	647.00	
8.35		Hiring of Dumper with 6 Cum capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	1860.00	
8.36		Hiring of Dumper with 10 Cum capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	2000.00	
8.37		Hiring of Dumper with 14 to 16 Cum capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	2200.00	
8.38		Hiring of Hydraulic Excavator 10 Tonne Operating weight capacity without rock breaking attachment and 0.6 cum Bucket capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	2200.00	
8.39		Hiring of Hydraulic Excavator 10 Tonne Operating weight capacity with rock breaking attachment including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	2500.00	
8.40		Hiring of Hydraulic Excavator 20 to 30 Tonne Operating weight capacity with rock breaking attachment including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	3030.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.41		Hiring of Hydraulic Excavator 20 to 30 Tonne Operating weight capacity without rock breaking attachment and with 0.9 to 1.2cum bucket capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	3250.00	
8.42		Hiring of Backhoe loader with excavator bucket including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	1280.00	
8.43		Hiring of Tractor with hydraulically operated trolley 45 to 50HP including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	900.00	
8.44		Hiring of Vibratory Compactor Pad Foot Type having minimum gross weight 10 to 12 Tonne, 30/36 Hz Frequency and minimum 1.5 mm amplitude and 250 Cum meter Hour Compaction capacity including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	2170.00	
8.45		Hiring of Truck mounted Water Tanker capacity 10000 Litter including Operator, Helper, Diesel/Oil and maintenance charges.	Hour	1200.00	
8.46		Hiring of Utility Vehicle including Operator, Toll Tax and maintenance charges			
		a) Hiring charges per km with diesel	Km	23.00	
		b) Hiring charges per month without diesel (3000 km running)	Month	28850.00	
8.47		Providing and fixing of new gate frame M.S. suitable for gate size mentioned made of angle			
		a) Up to 0.25 Sqm	Each	14900.00	
		b) 0.25-1 Sqm	Each	18245.00	
		c) 1.00-2.00 Sqm	Each	23110.00	
		d) 2.00-3.50Sqm	Each	24330.00	
		e) 3.50-5.00 Sqm	Each	27370.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
8.48		Providing and fixing of complete gate shutter with minimum 8 mm thickness skin plate & stiffeners made of angles and channels complete with all lead & lift for all material including labour charge and as directed by Engineer in Charge			
		a) Up to 0.25 Sqm	Sqm	47135.00	
		b) 0.25-1 Sqm	Sqm	45615.00	
		c) 1.00-2.00 Sqm	Sqm	44100.00	
		d) 2.00-3.50Sqm	Sqm	42575.00	
		e) 3.50-5.00 Sqm	Sqm	41050.00	
8.49		Under water Inspection work using Divers including cost of materials, sundry materials, transportation/conveyance and accommodation charges, labour charges etc. as per drawing specifications and or instructions given by engineer in charge. Charges per day			
		a) Up to 15 mtr depth	Day	72330.00	
		b) 16-25 mtr depth	Day	76670.00	
8.50		Under water Repair/maintenance work in Gate or concrete structure using Divers including cost of materials, sundry materials transportation/conveyance and accommodation charges, labour charges etc. as per drawing specifications and or instructions given by engineer in charge. Charges per day			
		a) Up to 15 mtr depth	Day	80380.00	
		b) 16-25 mtr depth	Day	83313.00	
8.51		Drilling of 125 mm dia. bore by reverse rotary or any other method in alluvium or overburdens (clay, sand, gravel, pebbles and boulders). Depth 0 to 70 m	M	655.00	
8.52		Drilling of 150 mm dia. bore by reverse rotary or any other method in alluvium or overburdens (clay, sand, gravel, pebbles and boulders). Depth 0 to 70 m	M	745.00	
8.53		Drilling of 175 mm dia. bore by reverse rotary or any other method in alluvium or overburdens	M	863.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		(clay, sand, gravel, pebbles and boulders). Depth 0 to 70 m			
8.54		Drilling of 200 mm dia. bore by reverse rotary or any other method in alluvium or overburdens (clay, sand, gravel, pebbles and boulders). Depth 0 to 70 m	M	903.00	
8.55		Drilling of 250 mm dia. bore by reverse Rotary or any other method in alluvium or overburden (clay, sand, gravel, pebbles and boulders). Depth 0 to 70 m.	M	1018.00	
8.56		Drilling of 300 mm dia. bore by reverse rotary or any other method in alluvium or overburdens (clay, sand, gravel, pebbles and boulders).			
		(a) Depth 0 to 70 m.	M	1225.00	
		(b) Beyond 70m and up to 150m depth	M	1300.00	
8.57		Drilling of 125 mm dia. bore in rock of all types and hardness by DTH unit/direct rotary with rock rollers.	M	1580.00	
8.58		Drilling of 150 mm dia. bore in rock of all types and hardness by DTH unit/direct rotary with rock rollers.	M	1740.00	
8.59		Drilling of 200 mm dia. bore in rock of all types and hardness by DTH unit/direct rotary with rock rollers.	M	2130.00	
8.60		Drilling of 250 mm dia. bore in rock of all types and hardness by DTH unit/direct rotary with rock rollers.	M	2529.00	
8.61		Supplying and fixing of E.R.W, MS pipes confirming to medium grade IS 1239(Part-1) & IS 4270 with screwed ends with sockets.			
		(i) 100 mm	M	1321.00	
		(ii) 125 mm	M	1663.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		(iii) 150 mm	M	2010.00	
		(iv) 200 mm	M	2709.00	
		(v) 250 mm	M	2996.00	
		(vi) 300 mm	M	3269.00	
8.62		Supply and fixing of E.R.W, MS slotted pipes confirming to medium grade IS 1239(Part-1) with slots of approved pattern (opening between 15% to 22 %).			
		(i) 100 mm	M	1388.00	
		(ii) 125 mm	M	1747.00	
		(iii) 150 mm	M	2110.00	
		(iv) 200 mm	M	2845.00	
		(v) 250 mm	M	3145.00	
		(vi) 300 mm	M	3430.00	
8.63		Supplying and fixing of ISI marked GI pipes of medium class with screwed ends with sockets. As per I.S.: 1239 (Part-2) 1992 with 4th revision			
		(i) 100 mm	M	1920.00	
		(ii) 125 mm	M	2190.00	
		(iii) 150 mm	M	2594.00	
		(iv) 200 mm	M	2753.00	
8.64		Supplying and fixing of I.S.I marked UPVC casing pipe confirming to IS 4985/ 1988(with up to date amendments) CM casing pipe			
		(i) 150 mm	M	815.00	
		(ii) 200 mm	M	1080.00	
8.65		Supplying and fixing of well cap of approved specification including labour charges for fixing etc., complete-			
		(a) 150 mm dia.	Each	600.00	
		(b) 200 mm dia.	Each	936.00	
		(c) 250 mm dia.	Each	1196.00	

Item No		Description of item	Unit	Rate	Remark
1		2	3	4	5
		(d) 300 mm dia.	Each	1416.00	
8.66		Development charges by compressor-			
		(i) with 7 cum/M	Hour	1025.00	
		(ii) with 9 cum/M	Hour	1230.00	
		(iii) above 9 cum/M	Hour	1533.00	
		(iv) Development by over pumping	Hour	1023.00	
8.67		Yield test by pumping-			
		(a) up to 0.03 cumec	Hour	1080.00	
		(b) More than 0.03 cumec and up to 0.06 cumec.	Hour	1460.00	
		(c) More than 0.06 cumec	Hour	1720.00	
8.68		Supplying & Installation of BEE rating ISI Marked required capacity, 50Hz, deep well submersible pump Stainless Steel body, suitable for column pipe & cable tubewell with Control Panel Starter suitable for Submersible pump with dry run protection, connections, including clamps, bore cap, column pipes/Nylon wire rope and connection cable etc. as required as per specifications. as below and equivalent.			
		(i) 100 LPM	Each	41260.00	
		(ii) 150 LPM	Each	45260.00	
		(iii) 200 LPM	Each	51282.00	
		(iv) 250 LPM	Each	57830.00	
		(v) 300 LPM	Each	65987.00	
8.69		Labour charges for installation of Pump in the tubewell, including transportation of pipes, pumps, column pipes, etc.-			
		(a) Electrical submersible pump	Each	2740.00	
		(b) Turbine pump electrically driven	Each	5905.00	
		(c) Turbine pump Diesel driven with foundation etc., complete.	Each	10040.00	

CHAPTER 9

PRELIMINARY AND MAINTENANCE WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include cost of:**
 - a) Labour.
 - b) Running charges of machines including fuel and lubricants.
 - c) Material required for execution of item of work.
 - d) All lead and lift of materials, machines and labours.
 - e) Wastage of Cement, Sand, Coarse Aggregate, Admixture, Concrete, Mortar etc.
 - f) Shuttering, Scaffolding, Form work, Vibration, and curing.
 - g) Testing of materials and quality assurance measures.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items are inclusive of loading and un-loading, standard finish required for concrete work, cleaning/preparation of cold and hot joint.
4. All the construction materials, workmanship and quality shall conform to the standards prescribed in IS Codes and Specification/Guidelines/ Circulars of CG Water Resources Department.
5. In Item no.9.33, the GST has been deleted from the language as well as rate of the item. Applicable GST on total amount of civil contract shall be added on the base amount worked out as per SOR 2025.
6. The running payment under the item of patrolling of canals shall be made up to 3 watering and the remaining payment shall be made after the irrigation is completely over as final payment.

CHAPTER-9
PRELIMINARY AND MAINTENANCE WORK
SCHEDULE OF RATES

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		A. PRELIMINARY WORK			
9.01		Ordinary shrub jungle (area below 25% covered by shrubs) clearance involving removal of grass, shrubs, bushes and twigs including rooting out and disposal and all other ancillary operation including all lead and lift etc., complete.	Sqm	0.70	
9.02		Medium shrub jungle (25% to 50% area covered by shrubs) clearance involving removal of grass, shrubs, bushes and twigs including rooting out & disposal and all other ancillary operation including all lead and lift etc., complete.	Sqm	1.60	
9.03		Thick shrub jungle (area above 50% covered by shrubs) clearance involving removal of grass, shrubs, bushes and twigs including rooting out and disposal and all other ancillary operation including all lead and lift etc., complete.	Sqm	4.00	
9.04		Removing stumps, tree roots etc., including excavation, stacking materials neatly and levelling surface and all other ancillary operation including all lead and lift etc., complete.			
	9.04.1	Girth up to 0.60 m	Each	46.00	
	9.04.2	Add for every additional 0.60 m girth	Each	46.00	
9.05		Clearance of Jalkumbhi/ Water Lily from water bodies including removing and rental cost of boat, labour etc., complete. and disposal of material by burning including all other charges for materials and machinery and all other ancillary operation including all lead and lift etc., complete.	Sqm	6.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		B. MAINTENANCE WORK			
9.06		Removing and re-constructing 22 cm to 45 cm thick dry stone pitching, with stones obtained from removal of old pitching, to specified slopes including wedging with stone chips, finishing surface and all other ancillary operation including all lead and lift etc., complete.	Sqm	76.00	
9.07		Removing and re-constructing 22 cm to 45 cm thick dry stone pitching, over 300 mm thick graded filter media. consisting of sand and gravel satisfying specified filter criteria laid in layers of 150 mm thick each using sand from approved quarry and stones and gravel/ metal obtain from removed pitching for re- construction, including cost of sand, labour, laying filter and stones, to specified slopes, wedging with stone chips, finishing surface and all other ancillary operation including all lead and lift etc., complete.	Sqm	281.00	
9.08		Removing rock-toe/ boulder toe and filter layers below rock-toe/ boulder toe including stacking all materials separately as directed and all other ancillary operation including all lead and lift etc., complete.	Sqm	175.00	
9.09		Reconstructing rock-toe, including filter media., below/ behind rock-toe, consisting of 300 mm thick sand layer and 300 mm thick gravel/ metal layer, satisfying specified filter criteria laid in layers, using sand from approved quarry and stones and filter gravel/ metal obtained from rock-toe removed for reconstruction including cost of sand, labour, laying filter and stones to specified slopes, wedging with stone chips, finishing surface and all other ancillary operation including all lead and lift etc., complete.	Sqm	390.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
9.10		Removing and resetting disturbed flag stone lining in CM 1:3 proportions by volume including cost of all materials, labour, finishing, curing and all other ancillary operation including all lead and lift etc., complete.			
	9.10.1	Up to 40 mm thick	Sqm	71.00	
	9.10.2	Above 40 mm thick	Sqm	81.00	
9.11		Removing and re-fixing disturbed centerline/ chainage/ demarcation stones including excavation, back filling after refixing stone and all other ancillary operation including all lead and lift etc., complete.	Each	81.00	
9.12		Earthwork for embankment for breached/ damaged portion of dam/ canal, using selected impervious soil from approved borrow area/ spoil bank in 100 to 150 mm layers (before compaction), including cost of materials, machinery, labour, all other operations such as collection of soil, spreading soil in layer of specified thickness, sorting out, breaking clods, levelling, sectioning edges/sides, watering, compacting to achieve maximum dry density using sheep foot roller/ vibratory compactors and all other ancillary operation including all lead and lift etc., complete.	Cum	282.00	
9.13		Repairing rain cuts/ re-sectioning canal slopes to required lines and grades as directed, using available canal side soil including dressing, packing soil, breaking clods, watering, tamping and all other ancillary operation including all lead and lift etc., complete.	Sqm	7.00	
9.14		Maintenance of canals wherever required, having bed width more than 5m or discharge more than 10 cumecs (as applicable) & depth of canal < 3m by deploying a unit of T-210 or T-110, Dumper/ Tractor trolley and 10 numbers of labour, to restore the bed levels and side slopes of canal section, including service road to proper condition, including			

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		clearance of all vegetation such as grass, shrubs, bushes etc. and disposal of surplus and un-useful earth or borrow of earth, as required, including cost of all materials, labour and transportation and all other ancillary operation including all lead and lift etc., complete.			
	9.14.1	For earthen canal	Km	49223.00	
	9.14.2	For lined canal	Km	12306.00	
9.15		Maintenance of canals wherever required, having bed width more than 5m or discharge more than 10 cumecs (as applicable) & depth of canal > 3m by deploying a unit of T-210 or T-110, Dumper/ Tractor trolley and 10 number of labours, to restore the bed levels and side slopes of canal section, including service road to proper condition, including clearance of all vegetation such as grass, shrubs, bushes etc. and disposal of surplus and un useful earth or borrow of earth, as required, including cost of all materials, labour and transportation and all other ancillary operation including all lead and lift etc., complete.			
	9.15.1	For earthen canal	Km	56256.00	
	9.15.2	For lined canal	Km	14064.00	
9.16		Maintenance of canals wherever required, having bed width between 1m to 5m or discharge between 1 cumec to 10 cumecs (as applicable) by deploying a unit of JCB, Dumper/ Tractor trolley and 10 numbers of labour to restore the bed levels and side slopes of canal section including service road to proper condition including clearance of all vegetation such as grass, shrubs, bushes etc. and disposal of surplus earth, as required, including cost of all materials, labour and transportation and all other ancillary operation including all lead and lift etc., complete.			

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
	9.16.1	For earthen canal	Km	13992.00	
	9.16.2	For lined canal	Km	3498.00	
9.17		Maintenance of canals wherever required, having bed width less than 1 m or discharge less than 1 cumec (as applicable) by deploying a unit of JCB, Dumper/ Tractor trolley and 10 numbers of labour to restore the bed and side slopes of canal section including service road to proper condition including clearance of all vegetation such as grass, shrubs, bushes etc. and disposal of surplus earth or borrow of earth, as required, including cost of all materials, labour and transportation and all other ancillary operation including all lead and lift etc., complete.			
	9.17.1	For earthen canal	Km	3229.00	
	9.17.2	For lined canal	Km	807.00	
9.18		Clearance of silt and debris and maintenance (wherever required) of one row Hume pipe of diameter up to 2 m syphon or cross drainage or V.R.B. structures including upstream and downstream reaches to restore the structures to original shape, such as repair of cracks in parapet wall and/ repair of pitching & other protection works including cost of all material, labour and transportation and all other ancillary operation including all lead and lift etc., complete.	Per structure	2746.00	
9.19		Add for each additional row (in case of structure having more than one row)	Row	412.00	
9.20		Clearance of silt and debris and maintenance (wherever required) of one row home pipe of diameter more than 2 m syphon or cross drainage or V.R.B. structures including upstream and downstream reaches to restore the structures to original shape, such as repair of cracks in parapet wall and/ repair of pitching & other protection works including cost of all material, labour and transportation and all	Per structure	3205.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		other ancillary operation including all lead and lift etc., complete.			
9.21		Add for each additional row (in case of structure having more than one row)	Row	481.00	
9.22	9.22.1	Clearance of silt and debris and maintenance of R.C.C. trough aqueduct (wherever required) having span up to 15 m including all repair works as required for upstream and downstream reaches to restore the structures to original shape, such as repair of cracks in parapet wall, repair of pitching & other protection works including cost of all material, labour and transportation and all other ancillary operation including all lead and lift etc., complete.	Per structure	4374.00	
	9.22.2	Add extra for each additional 5 m. span in item No. 9.22.1	M	656.00	
9.23		Repair of structures using M 15 cement concrete (Design mix) including cost of all material, labour and transportation and all other ancillary operation including all lead and lift etc., complete.	Per structure	3966.00	
9.24		Clearance with uprooting of grass shrubs, bushes, debris from canal bed & slopes for maintenance work by labour, wherever required, before start of irrigation through canals, including disposal of uprooted materials at sufficient distance and all other ancillary operation including all lead and lift etc., complete.			
	9.24.1	For canal depth up to 3 m.	Sqm	3.00	
	9.24.2	For canal depth more than 3 m.	Sqm	3.75	
9.25		Repair of Brick/ stone masonry work with plastering or pointing with watering including cost of all materials, labour and transportation and all other ancillary operation including all lead and lift etc., complete.	Per structure	3827.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
9.26		Removing and hauling all kinds of soil/ soft rock including boulders up to 0.6 m. diameter slipped due to natural/ geological causes and disposing off the same in specified dump area or as directed, including cost of all materials, machinery, labour, forming steps/ ramp ways and all other ancillary operation including all lead and lift etc., complete.	Cum	180.00	
9.27		Removing carefully plain cement concrete/ Stone slabs from the side lining of canal and stacking the same on the road side/ canal bed and all other ancillary operation including all lead and lift etc., complete.	Sqm	46.00	
9.28		Providing and fixing 100 x 50 mm 10 gauge non- galvanized weld mesh to concrete/ masonry surface including cost of all materials, machinery, labour, fixing wire mesh to exposed reinforcement bars or by driving rafter nails, scaffolding and all other ancillary operation including all lead and lift etc., complete.	Sqm	327.00	
9.29		Providing and filling/ replacing gear oil of approved quality up to the required gauge level for reduction gear unit of hoists/ gantry cranes including cost of all materials, machinery, labour and all other ancillary operation including all lead and lift etc., complete.	Litre	385.00	
9.30		Providing and applying grease of approved quality to gate and hoist components requiring greasing as part of annual maintenance using grease gun wherever necessary including cost of all materials, machinery, labour, scaffolding and all other ancillary operation including all lead and lift etc., complete.	Kg	472.00	
9.31		Providing and applying cardium compound of approved quality to wire ropes of hoists/ gantry cranes as part of annual maintenance including cost of all materials, machinery, labour and all other ancillary operation	Kg	217.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		including all lead and lift etc., complete.			
9.32		Providing and filling/ replacing hydraulic oil of approved quality up to the required gauge level including cost of all materials, machinery, labour and all other ancillary operation including all lead and lift etc., complete.	Litre	187.00	
9.33		BGM Lining on structures: Supplying, laying and welding Bituminous Geomembrane as waterproofing liner over concrete structure, having average thickness of 4 mm (minimum thickness 3.6 mm), minimum width of 5 m, minimum tensile strength of 15 KN/ m and minimum permissible elongation of 50%, metallic strip clamping & anchorage, including applying bitumen primer, which shall be laid on the finished concrete surface including wastage, import duties & custom clearance charges, transportation, labour charges, BGM joint testing which shall confirm to ASTM/ IS standards and excluding BGM overlap, civil works such as dismantling/ finishing of concrete surface , earthwork preparation, dewatering and all other ancillary operation including all lead and lift etc., complete.	Sqm	3815.00	
9.34		Fabric formed erosion and scour protection concrete mattress: Supply and laying of double layers of Polyester Woven geotextile fabric form stitched together having minimum composite mass of 400 gram per sqm (for double layer) including all leads and lifts, complete and excluding supply and pouring of fine aggregate concrete. The wide width tensile strength of the fabric shall not be less than 50kN/ m. Design shall be as Per IRC 89 and IRC SP 113. Note: The grout rates should be adopted as Per item no. 9.35			
	9.34.1	Supplying and placing of Articulating Cabled Block made from woven geotextile fabric form with reinforcing galvanized steel cables on one direction as per the detailed design,	Sqm	1784.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		thickness and technical specifications. The mattress shall be customized as Per site geometry or profile at factory in the form of panels along with geotextile baffles and one panel shall be connected with the adjacent panel by using Industrial Zipper. Cables shall be of minimum 6mm diameter and the breaking strength of the cable shall not be less than 30kN.			
	9.34.2	Supplying and placing of Articulating Cabled Block made from woven geotextile fabric form with reinforcing galvanized steel cables on both directions as per the detailed design, thickness and technical specifications. The mattress shall be customized as per site geometry or profile at factory in the form of panels along with geotextile baffles and one panel shall be connected with the adjacent panel by using Industrial Zipper. Cables shall be of minimum 6mm diameter and the breaking strength of the cable shall not be less than 30kN.	Sqm	2139.00	
	9.34.3	Supplying and placing of fabric form concrete mattress with filtration points as per the detailed design, thickness and technical specifications and having the filter point centre to centre horizontal and vertical spacing of (a) 125 mm for 55mm thick mattress, (b) 165 mm for 75mm thick mattress, (c) 200 mm for 100mm thick mattress, (d) 255 mm for 150mm thick mattress, (e) 305 mm for 200mm thick mattress, (f) 355 mm for 250mm thick mattress and (g) 405 mm for 300mm thick mattress. The mattress shall be customized as per site geometry or profile at factory in the form of panels along with geotextile baffles and one panel shall be connected with the adjacent panel by using Industrial Zipper.	Sqm	1258.00	
	9.34.4	Supplying and placing of woven geotextile fabric form concrete mattress having uniform cross section as per the detailed design, thickness and technical specifications. The mattress shall be customized as per site	Sqm	1699.00	

Item No.		Description of item	Unit	Rate	Remark
1		2	3	4	
		geometry or profile at factory in the form of panels along with geotextile baffles and one panel shall be connected with the adjacent panel by using Industrial Zipper.			
9.35		Providing and placing Grout Mix having minimum compressive strength of 20 MPA at 28 days in Polyester-woven geotextile fabric by suitable grout pumping aid, when made and tested in accordance with IS 516:2021, Including all leads and Lift, Complete. The sand/ cement ratio shall be determined by the ready mix manufacture and shall be on the order of 2:4:1. The Water/ Cement ratio shall be of the order of 0.7 as per the approved Drawing/ the direction of Engineer-In-Charge	Cum	643.00	
9.36		Patrolling of canal during irrigation of any crop including ordinary jungle clearance, removing obstacles & foreign materials from canal section, including opening & closing of Colaba gates / opening on demand for water by cultivators and including such minor repair works which are essential for proper running or water in canal as directed by Engineer in charge.	Ha	46.00	
9.37		Providing stacking, boxing, spreading and dressing of hard moorum including all lead and lifts and cost of all materials etc., complete.	Cum	438.00	

CHAPTER-10

MATERIAL TESTING AND MODEL STUDIES

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. **Rates include the following: -**
 - a) Cost of material used for testing /model studies.
 - b) Cost of salvage value of machinery /equipment used for testing.
 - c) Cost of water used for model studies.
 - d) Cost of labour and supervisory staff engaged for material testing/model studies.
3. **Sampling of Material: -**
 - a) Each representative sample shall be distinctly marked for identification and securely packed to avoid damage or loss of fine particles during transit. The outside cover should bear proper seal or name of sender as well as that of the receiving officer of research formation. A tin or plastic sheet showing all details of the sample should also be kept inside the sample.
 - b) Specifications for sampling of undisturbed soil samples should be rigidly followed. Utmost care by way of wax sealing and safe transit must be taken to see that the in-situ conditions are not changed until the samples are received in the laboratory.
 - c) No freight charges will be borne by the laboratory for the samples supplied to the laboratory.
 - d) The quantities of samples for testing should be supplied to the laboratory as given in quality control manual of **WRD C.G.**
4. **(A) SOIL & MATERIAL TESTING:**
 - a) A program for material /soil testing or model testing should be prepared by field authorities showing in denting date and date of test result desired.
 - b) The time period required for different tests are given in Quality Control Manual of WRD C.G.
 - c) A detailed report with drawings showing location of trial pit, borrow, logs of bore hole data, geological details, depth of water table and other relevant information should be submitted to laboratory to understand the properties to be evaluated and accordingly planning the testing methodology.**(B) MODEL STUDY:**
 - a) The project authorities will send a proposal for model study of their project such as dams, tunnel, canals, river study etc. to the director irrigation research.

- b) After receiving the proposal Research officer will send a list of documents required for model study
 - i. Detailed project report.
 - ii. Salient features of the project.
 - iii. Grid plan up to 500m u/s and 500m d/s from dam axis.
 - iv. L-section, X-section, Plan of structure to be tested.
 - v. TWL Curve for 100%,75%,50% and 25% of design flood or any other flood condition, if required.
 - vi. Hydraulic design of structure proposed for the study.
 - vii. Terms of reference for the study.
- c) After receiving the above data, estimate will be submitted to the field formation for 2D/3D model study as desired by the field authorities.
- d) TS for estimate will be given by the project authorities.
- e) G-schedule will be approved by the Director Irrigation Research.
- f) Then it will be sent for E-Tendering process to CE, e-Procurement.
- g) After fixing agency for the work, fund will be allotted by the **E-in-C** from the budget of the concerned project.
- h) for the work of other Department/ private agency, fund will be provided by the agency through Demand Draft in favor of **concerned chief engineer** and will be deposited in deposit head 8443/108
- i) Time Schedule for 3D Model Study
 - i. Time Required for Tendering Process = 1 Month
 - ii. Time for Construction of 3D Model = 45 Days
 - iii. Time for Study = 20 Days
 - iv. Time for Reporting = 10 Days
- j) Time Schedule for 2D Model study
 - i. Time Required for Tendering Process = 1 Month
 - ii. Time for Construction of 2D Model = 30 Days
 - iii. Time for Study = 20 Days
 - iv. Time for Reporting = 10 Days

5. a) On receipt of program showing desired tests and consequent indenting dates, priority for testing will be decided on the basis of indenting date/receipt of sample. Then **concerned Research officer** Soil & Material testing will prepare a proforma bill of testing charges as per rates shown in this chapter. The charges shall be paid by the sponsoring authority well before the indenting date. Testing will be started after receipt of testing charges. in case of delay in payment the priority fixed will be lost and it will

be arranged after last member of the list. If during testing the sponsor desire to get additional test conducted, then additional amount will be required to be paid.

- b) Testing of cement concrete and cement mortar cubes will be given top priority as per casting date.
 - c) If any party desires to have test results on special priority, then they should contact **concerned Research officer** in advance who will decide the programme for such job with respective **assistant research officer** to trace scope for such testing job. The test will be conducted as per the programme approved by DIR. The charges for such testing will be 10% higher.
 - d) for items, not included in this schedule of rates, separate rates will be quoted depending on the type of job involved.
6. NOC for any test to be conducted for any organization other than CGWRD will be granted by **concerned Research officer** on merits of case.
 7. Once the results are sent to the party concerned, request for rechecking of these results will be done if the **concerned Research officer** feels it to be justified. Extra charges, if any fixed by the **concerned Research officer**, will have to be paid for such retesting.
 8. The testing will be carried out by the staff of the **concerned Research officer** alone, and no other party will be permitted to carry out the test. Any interested party can only watch the testing procedure if prior permission is provided by SE (BODHI), WRD Raipur (CG)/ **concerned Research officer** WRD.
 9. For all tests, Indian Standard specifications would be followed where applicable.
 10. **Concerned Research officer** the right to publish the result of any test without taking permission of the party concerned.
 11. The samples supplied for testing will be stored up to a period of 3 months after their reports are communicated to the party and after this period, they will be finally disposed-off.
 12. In matters of dispute and interpretations of any rules and results, the decision of the **Engineer- in- Chief** will be final.
 13. For field tests, rates cover the cost for testing only. The transportation cost for equipment's to site of work will be charged extra as per actual or may be arranged by the party for whom the work is undertaken.
 14. The preparation of site, including excavation of pits, areas, scaffolding, de- watering, air supply, meter charges for electricity, drilling cost, water supply, fixing of anchor rods, concrete pedestals and foundations, supply of labour, tools and plants and all such other miscellaneous arrangements which are directly or indirectly connected with actual performance of field test will be the responsibility of the party. This should be arranged in advance in consultation with the concerned **assistant research officer /Research officer**.
 15. Normal facilities like residential accommodation conveyance etc. for the staff deputed for conducting the field tests will be provided by the party.

16. WORKS OF OTHER AGENCIES/DEPARTMENTS:

- A. During the visit of laboratory staff to the field for conducting field test, travelling allowance and dearness allowance will be charged extra.
- B. 25 % of sum of (A) and estimate prepared for testing work will be charged additionally.

17. The following IS Codes may be referred for the Soil and Material Testing:

S. No.	IS Codes	Title
1	460:1985	Test Sieves
2	460 (Part I):1985	Wire Cloth Test Sieves (Third Revision) (Reaffirmation 2004)
3	460 (Part II):1985	Perforated late (Test Sieves (Third Revision)
4	460 (Part III):1985	Method of Examination of Test Sieves (Third Revision) (Reaffirmation 2001)
5	456:2000	Code of Practice for Plain and Reinforced Concrete (Third Revision) (Reaffirmation 2005)
6	516:2000	Methods of Tests for Strength of Concrete (with Amendment No. 2) (Reaffirmation 2004)
7	650:1991	Standard Sand for Testing of Cement (First Revision with Amendment No. 2) (Reaffirmation 2008)
8	1121:1974	Method of Test for Determination of Strength Properties of Natural Building Stone
9	1121 (Part I):1974	Compressive Strength (First Revision with Amendment No.1) (Reaffirmation 2008)
10	1121 (Part IV):1974	Shear Strength (First Revision) (Reaffirmation 2003)
11	1122:1974	Methods of Test for Determination of True Specific Gravity of Natural Building Stone (First Revision.) (Reaffirmation 2003)
12	1124:1974	Method of Test for Determination of Water Absorption, Apparent Specific Gravity and Porosity of Natural Building Stone. (First Revision) (Reaffirmation 2003)
13	1125:1974	Method of Test for Determination of Weathering of Natural Building Stone (First Revision) (Reaffirmation 2003)
14	1126:1974	Method of Test for Determination of Durability of Natural Building Stones (First Revision) (Reaffirmation 2008)
15	1199:1959	Method of Sampling and Analysis of Concrete (Reaffirmation 2004)

16	1498:1970	Classification and Identification of Soil for General Engineering Purpose (First Revision) (Reaffirmation 2007)
17	1727:1967	Method of Test for Pozzolanic Material (First Revision) (Reaffirmation 2004)
18	1888:1982	Method of Load Test on Soils (First Revision) (Reaffirmation 2002)
19	2386:1963	Method of Test for Aggregates for Concrete
20	2386 (Part I):1963	Particle Size and Shape (Amendment March 2010) (Reaffirmation 2002)
21	2386 (Part II):1963	Estimate of Deleterious Material and Organic Impurities (Reaffirmation 2011)
22	2386 (Part III):1963	Specific Gravity, Density, Voids, Abrasion and Bulking (Reaffirmation 2002)
23	2386 (Part IV):1963	Mechanical Properties (with Amendment No.1) (Reaffirmation 2002)
24	2386 (Part V):1963	Soundness (Reaffirmation 2002)
25	2386 (Part VI):1963	Measuring Mortar Making Properties for Fine Aggregate (Reaffirmation 2011)
26	2386 (Part VII):1963	Alkali Aggregate Reactivity (Reaffirmation 2002)
27	2430:1969	Method of Sampling for Aggregate for Concrete (Reaffirmation 2005)
28	2720:1983	Method of Test for Soil
29	2720 (Part I):1983	Preparation of Dry Soil Samples for Various Test (First Revision) (with Amendment No. 1) (Reaffirmation 2006)
30	2720 (Part II):1973	Determination of Water Content (Second Revision) (Reaffirmation 2010)
31	2720 (Part III):1980	Determination of Specific Gravity (Reaffirmation 2002)
32	2720 (Part III Section I):1980	Section I – Fine Grained Soil (First Revision) (Reaffirmation 2002)
33	2720 (Part-III/Sec- II):1980	Section-II Fine, Medium and Coarse Grained Soils (First Revision) (Reaffirmation 2002)
34	2720 (Part-IV): 1985	Grain Size Analysis (Second Revision) (Reaffirmation 2006)
35	2720 (Part-V) :1985	Determination of Liquid and Plastic Limit (First Revision) (Reaffirmation 2006)

36	2720 (Part- VI):1972	Determination of Shrinkage Factors (First Revision). (Reaffirmation 2001)
37	2720 (Part-VII):1980	Determination of Water Content, Dry Density Relation Using Light Compaction. (Reaffirmation 2011)
38	2720 (Part-VIII):1983	Determination of Water Content, Dry Density Relation Using Heavy Compaction (Third Revision) (with Amendment No. 1). (Reaffirmation 2006)
39	2720 (Part-IX):1992	Determination of Dry Density, Moisture Content Relation By Constant Weight or Soil Method (with Amendment No. 1) (Reaffirmation 2002)
40	2720 (Part-X):1991	Determination of Unconfined Compressive Strength (Second Revision) (Reaffirmation 2006)
41	2720 (Part- XI):1993	Determination of Shear Strength Parameter of a Specimen Tested in Unconsolidated, Un Drained Triaxial Compression without The Measurement of Pore Water Pressure (Amendment No 1&2) (Reaffirmation 2002)
42	2720 (Part- XII):1981	Determination of Shear Strength Parameter of Soil from Consolidated Un Drained Triaxial Compression Test with Measurement of Pore Water Pressure. (Reaffirmation 2002)
43	2720 (Part-XIII):1986	Direct Shear Test (Second Revision) (Reaffirmation 2002)
44	2720 (Part- XV):1965	Determination of Consolidation Properties (with Amendment No. 1 &2) (Reaffirmation 2002)
45	2720 (Part-XVI):1987	Laboratory Determination of CBR (First Revision) (Reaffirmation 2002)
46	2720 (Part-XVII):1986	Laboratory Determination of Permeability (with Amendment no.1) (Second Revision) (Reaffirmation 2002)
47	2720 (Part - XXI):1977	Determination of Total Soluble Solids (First Revision) (Reaffirmation 2006)
48	2720(Part-XXIII):1976	Determination of Calcium Carbonate (First Revision) (Reaffirmation 2006)
49	2720(Part-XXVI):1987	Determination of pH Values(Second Revision) (Reaffirmation 2002)
50	2720(Part-XXIX):1975	Determination of Dry Density of Soil in-Place by The Core Cutter Method (First Revision) (Reaffirmation 2005)
51	2720 (Part-XL):1970	Determination of Free-Swell index of Soils (Reaffirmation 2002)
52	2720 (Part- XLI):1977	Measurement of Swelling Pressure of Soils (Reaffirmation 2002)
53	2809:1972	Glossary of Terms and Symbols Relating to Soil Engineering (First Revision) (Reaffirmation 2006)

54	3025 (Part XIV):2013	Conductivity for Water by Conductivity Meter
55	3025 (Part X):1984	Turbidity Test of Water by Turbidity Meter (Reaffirmation 2002)
57	3025 (Pt. 32):1988	Chloride Test of Water by Spectrophotometer (Reaffirmation 2007)
58	3025 (Pt. 60):2009	Fluoride Test of Water by Spectrophotometer
59	3025 (Pt. 4) :1986	Sulphate Test of Water by Spectrophotometer (Reaffirmation 2003)
60	3025 (Pt. 53)	Iron Test of Water by Spectrophotometer
61	ASTM D 859:10	Silica Test of Water by Spectrophotometer
62	ASTM D 3867:09	Nitrate- Nitrite Test of Water by Spectrophotometer
63	3495 (Pt I to IV):1992	Method of Test of Burnt Clay Building Bricks (Third Revision) (with Amendment No.1) (Reaffirmation 2002)
64	3812 (Pt. I):2013	Loss of Ignition Fly Ash /Silica
65	4031: 1996	Methods of Physical Test for Hydraulic Cement (Reaffirmation 2004)
66	4032:1985	Method of Chemical Analysis of Hydraulic Cement (Reaffirmation 2005)
68	4464:1985	Code of Practice of Presentation of Dealing information and Core Description in Foundation, investigation (Reaffirmation 2004)
69	4968:1976	Method of Sub Surface Sounding for Soils
70	4968:(Pt-II)1976	Dynamic Methods Using Core and Bentonite Slurry (First Revision) (with Amendment No. 1) (Reaffirmation 2007)
71	4968 (Pt-III):1976	Static Cone Penetration Test (First Revision) (Reaffirmation 2002)
72	5513:1996	Vicat Apparatus (Second Revision) (Reaffirmation 2005)
73	5514:1996	Apparatus used in Le Chatelier Test (Reaffirmation 2005)
74	5529:2013	Code of Practice for in-Situ Permeability Tests
75	5529(Part-I):2013	Tests of Overburden

76	5529(Part-II):2006	Tests in Bed Rock
77	7320:1974	Concrete Slump Test Apparatus (Reaffirmation 2008)
78	7746:1991	Code of Practice for in-Situ Shear Tests of Rock (with Amendment No. 1) (Reaffirmation 2005)
79	8085:1965	Method of Test for Permeability of Cement Mortar and Concrete (Reaffirmation 2002)
80	8763:1978	Guide for Undisturbed Sampling of Sands (Reaffirmation 2002)
81	8764:1998	Methods of Determination of Point Load Strength index of Rocks
82	9013:1978	Method of Making Curing and Determining Compressive Strength of Accelerated Cured Concrete Specimens (Reaffirmation 2008)
83	9143:1979	Method for The Determination of Unconfined Compressive Strength of Rock Materials (Reaffirmation 2001)
84	9179: 1979	Method for Preparation of Rock Specimen for Laboratory Testing (Reaffirmation 2001)
85	9259:1979	Liquid Limit Apparatus for Soils (with Amendment No. 1) (Reaffirmation 2002)
86	9376:1979	Apparatus for Measuring Aggregate Crushing Value and 10 % Fines Value. (Reaffirmation 2004)
87	9377: 1979	Apparatus for Aggregate Impact Value (Reaffirmation 2004)
88	9399: 1979	Apparatus for Flexural Testing of Concrete (Reaffirmation 2004)
89	9399:1980	Apparatus for Uses in Measurement of Length Change of Hardened Cement Paste, Mortar and Concrete (Reaffirmation 2004)
90	9669:1980	CBR Moulds and Its Accessories (Reaffirmation 2002)
91	10050:1981	Slake Durability Index Rocks, Methods for Determination (Reaffirmation 2001)
92	10740:1983	Operating Requirement or Power Implements (Reaffirmation 2004)
93	SP 23:1982	Hand Book On Concrete Mix Design. (Based On Indian Standard) (Reaffirmation Six Reprint Nov:2001)
94	SP-36:1987(Part- I)	Compendium of Indian Standards on Soil Engineering (Laboratory Testing) (Reaffirmation First Pub. Mar 1989)
95	SP-36-1988 (Part- II)	Compendium of Indian Standards on Soil Engineering (Part II) Field Testing of Soil for Civil Engineering Purpose (CED-43: Soil and Foundation Engineering)

For model studies:

1	10137:1982	Guidelines for selection of spillways and energy dissipaters. (Reaffirmation 2004)
2	7365:2010	Criteria for hydraulics designs of buckets II Revision
3	4997:1968	Criteria for Design of Hydraulics Jump type stilling basin for energy dissipaters. (Reaffirmation 1995)
4	5186 :1994	Design of Chute and side channel spillways.

CHAPTER-10

Material Testing and Model Studies

Schedule of Rates

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	Soil testing - (I) Laboratory Test			
10.01	Grain size analysis (IS 2720 Part IV)	Sample	1480.00	
10.02	Apparent specific gravity test (IS 2720 Part III and Sec. I and II of Part III)	Sample	447.00	
10.03	Liquid, Plastic and Shrinkage limits (IS 2720/ Part V & VI).	Sample	990.00	
10.04	Standard (light Compaction test/ relative density test (IS 2720 Part VII and VIII).	Sample	1124.00	
10.05	Laboratory permeability test (IS 2720 Part XVII).	Sample	2196.00	
10.06	Effective shear parameters by consolidated un drained test by triaxial machine on 37.5 mm dia. sample.	Sample	4010.00	
10.07	Determination of in-situ moisture content and density of undisturbed sample (IS 2720 Part XXIX).	Sample	419.00	
10.08	Shear parameters by quick saturated test (Sat) by triaxial machine on undisturbed samples (IS 2720 Part XI).	Sample	4196.00	
10.09	Shear parameters by quick test on sample at OMC & MDD or NMC & NDD by triaxial machine on 37.5 mm dia. sample (IS 2720 Part XI).	Sample	3129.00	
10.10	Box shear test (IS 2720 Part XIII)-			
	(a) At OMC & MDD	Sample	1119.00	
	(b) On undisturbed sample	Sample	1119.00	
10.11	Consolidation test on disturbed or undisturbed samples	Sample	2001.00	
10.12	California bearing ratio (IS 2720 Part XVI).	Sample	1695.00	
10.13	Void ratio	Sample	381.00	
10.14	Chemical tests on soils-			
	(a) Lime content test (IS 2720 Part XXIII)	Sample	479.00	
	(b) Soluble salt test (IS 2720 Part XXI)	Sample	542.00	
10.15	Chemical test for water suitability for Irrigation use.	Sample	1148.00	
10.16	Unconfined compression test on 37.5 mm dia. Sample	Sample	1602.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
10.17	Swelling pressure test-			
	(a) Free swell (IS 2720 Part XL).	Sample	587.00	
	(b) Swelling pressure (IS 2720 Part XLI).	Sample	1116.00	
10.18	Bearing capacity of soil by triaxial shear test on soil sample.	Sample	5055.00	
II-Field Tests				
10.19	Load bearing test on soil (IS 1881)	No.	14901.00	
10.20	Field permeability test-			
	(a) Pumping in test (IS.5529 Part I)	No.	5597.00	
	(b) Pumping out test (IS 5529 Part II)	No.	7059.00	
10.21	Vane shear test on soft fine grained soil (IS 4434).	No.	3818.00	
10.22	(a) Static cone penetration test (IS 4968 part II & III).	No.	5105.00	
	(b) In-situ shear test on rock (IS 7746)	No.	9482.00	
Material Testing				
(I) Test on Cement				
10.23	Fineness modulus test (IS 4031)			
	(a) By sieving method sample	Sample	528.00	
	(b) By specific surface i.e. air permeability apparatus.	Sample	878.00	
10.24	Consistency test (IS 4031)	Sample	593.00	
10.25	Test for setting time (IS 4031)	Sample	651.00	
10.26	Specific gravity test (IS 4031)	Sample	485.00	
10.27	Heat of Hydration test (IS 4031)	Sample	1643.00	
10.28	Soundness test (IS 4031)			

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	(a) By Le-chatelier's method	Sample	581.00	
	(b) By Autoclave method	Sample	1108.00	
10.29	Tensile strength (IS 4031)			
	(a) Preparing 12 specimen and curing	Job	808.00	
	(b) Testing 12 specimens	Job	202.00	
10.30	Compressive strength of cement (IS 4031)			
	(a) Preparing six specimen and curing	Job	1034.00	
	(b) Testing six specimens	Job	243.00	
(II) Test on Aggregates Including Sand-				
10.31	Sieve analysis (IS 2386 Part I)	Sample	463.00	
10.32	Unit weight or bulk density (IS 2386 Part III)	Sample	335.00	
10.33	Test for organic Impurities (IS 2386 Part II)	Sample	488.00	
10.34	Absorption and specific gravity test (IS 2386 part III)	Sample	1153.00	
10.35	Absorption of aggregate (IS 2386 part III)	Sample	580.00	
10.36	Test for finding out % of clay, fine silt and fine dust (IS 2386 part II)	Sample	693.00	
10.37	(a) Soundness test (10 cycles) (IS 2386 part V)	Sample	5607.00	
	(b) Soundness test (5 cycles) (IS 2386 part V)	Sample	3314.00	
10.38	Aggregate impact test (IS 2386 part IV)	Sample	487.00	
10.39	Abrasion test by any of the following method			
	(a) Deval Abrasion test machine (IS 2386 part IV)	Sample	1169.00	
	(b) by Los Angeles machine	Sample	1162.00	
	(c) by Derry 's Abrasion test machine	Sample	1136.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
10.40	Aggregate crushing value (IS 2386 part IV)	Sample	1104.00	
10.41	Compressive strength of stone specimen (IS 2386 part V)			
	(a) cutting and dressing stone block of size 10x10X10 cm	Sample	346.00	
	(b) Testing the above specimen	Sample	238.00	
10.42	Determination of Coal. Lignite and shale in aggregates (IS 2386 Part II)	Sample	598.00	
10.43	Alkali aggregate reactivity test as per ASTM (Reduction of Alkali silica release test) (IS 2386 Part VII).	Sample	2370.00	
10.44	Potential alkali aggregate reactivity test (IS 2386 Part VII).	Sample	4612.00	
(III) Test on Concrete				
10.45	Compressive strength of cube specimen of size 15 cm (IS 516)-			
	(a) Preparing cubes including curing for specified time (minimum for 6 specimens).	No.	222.00	
	(b) Testing of one specimen	No.	230.00	
10.46	Compressive strength of cube specimen of 10 cm (IS 516)			
	(a) Preparing cube specimen of 10 cm size including curing.	No.	227.00	
	(b) Testing specimen	No.	203.00	
10.47	(a) Preparing cylindrical specimen of size 15 cm dia.X30 cm height including curing (IS 516).	No.	330.00	
	(b) Testing cylindrical specimen	No.	335.00	
10.48	(a) Preparing cylindrical specimen of size 10 cm dia.X20 cm height including curing (IS 516)	No.	242.00	
	(b) Testing cylindrical specimen	No.	235.00	
10.49	Flexural strength-			
	(a) Preparing concrete beam of size 10X10X50 cm.	No.	233.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	(b) Testing specimen	No.	163.00	
10.50	(a) Nondestructive test of concrete by pulse velocity meter min. no. of specimen three no.	No.	2764.00	
	(b) Nondestructive test of concrete by rebound hammer min. no. of specimen three no.	No.	1379.00	
	(c) Compressive strength test for concrete block	No.	303.00	
10.51	Determination of cement content in hardened concrete-			
	(a) By lime and calcium oxide determination process.	Sample	1683.00	
	(b) By silica process SiO ₂ determination (IS 1199).	Sample	1941.00	
10.52	Determination of permeability of concrete (IS 3085)	Sample	772.00	
10.53	Slump test	Sample	608.00	
(IV) Test on Bricks-				
10.54	Water absorption of burnt clay bricks (five specimens).	Job	1381.00	
10.55	Compressive strength of bricks (IS 3495)-			
	(a) Five Nos	Job	555.00	
	(b) One No.	Sample	121.00	
10.56	Determination of efflorescence (IS 3495)-			
	(a) Five Nos.	Job	512.00	
	(b) One No.	Sample	216.00	
10.57	Flexural strength	No.	281.00	
10.58	Specific gravity	Sample	252.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
10.59	Unit weight	Sample	330.00	
(V) Tests on Natural Building stone-				
10.60	Compressive strength test (IS 1121 Part I)-			
	(a) Preparing 3 specimen	Job	479.00	
	(b) Testing above 3 specimens	Job	198.00	
10.61	Shear strength test (IS 1121 Part IV)-			
	(a) Preparing 3 specimen	Job	479.00	
	(b) Testing above 3 specimens	Job	262.00	
10.62	Specific gravity and porosity test (3 specimens) (IS 1122).	Job	1071.00	
10.63	Water absorption test (24 hour immersion and five hours boiling test)-			
	(a) Preparing specimen	No.	265.00	
	(b) Testing specimen	No.	247.00	
10.64	Durability test (IS 1126)-			
	(a) Preparing specimen	No.	265.00	
	(b) Testing the specimen	No.	2359.00	
10.65	Weathering test (IS 1125)-			
	(a) Preparing specimen	No.	539.00	
	(b) Testing the specimen	No.	2405.00	
10.66	Abrasion test-			
	(a) Preparing specimen	No.	588.00	
	(b) Testing specimen	No.	571.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
10.67	Compressive strength on cores (IS 1121 Part I)-			
	(a) Cores received, cut and polished	No.	348.00	
	(b) Cores drilled, cut and polished	No.	972.00	
	(c) Testing the specimen	No.	256.00	
10.68	Cubes received, Capped and tested specimen	No.	319.00	
(VI) Tests on Tiles-				
10.69	(a) Water absorption test	No.	263.00	
	(b) Determination of Flexural strength	No.	143.00	
	(c) Resistance of wear	No.	230.00	
	(d) Impact test	No.	405.00	
	(e) Permeability of tiles	No.	459.00	
(VII) Tests on Soil Cement Blocks-				
10.70	(a) Moisture absorption tests group of five.	Job	882.00	
	(b) Compressive strength test	Sample	230.00	
	(c) Weathering test	Sample	2483.00	
(VIII) Test on Chemical Admixture (Liquid)				
10.71	Dry material content in liquid admixture	Sample	1145.00	
10.72	Ash content of admixture	Sample	1257.00	
10.73	Relative Density of liquid admixture	Sample	240.00	
10.74	Chloride ion concentration of liquid admixture	Sample	339.00	
10.75	pH of liquid admixture	Sample	292.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	(IX) Test on Fly Ash/ Silica			
10.76	Specific Gravity of fly Ash/ Silica Fumes	Sample	526.00	
10.77	Loss of ignition Fly Ash/ Silica	Sample	457.00	
10.78	Determination of Fineness by sieving (Fly Ash)	Sample	717.00	
	(X) Test on Water			
10.79	Conductivity test of water by conductivity meter	Sample	165.00	
10.80	Turbidity test of water by Turbidity meter	Sample	159.00	
10.81	Nitrate test of water by Spectrophotometer	Sample	292.00	
10.82	Floride test of water by Spectrophotometer	Sample	262.00	
10.83	Sulphate test of water by Spectrophotometer	Sample	277.00	
10.84	Iron test of water by Spectrophotometer	Sample	245.00	
10.85	Silica test of water by Spectrophotometer	Sample	348.00	
10.86	Phosphate test of water by Spectrophotometer	Sample	261.00	
10.87	Nitrate test of water by Spectrophotometer	Sample	292.00	
10.88	Chloride test of water by Spectrophotometer	Sample	335.00	
10.89	Chlorine test of water by Spectrophotometer	Sample	246.00	
	(XI) Test on Aggregate & Rock			
10.90	(Aggregate test) Determination of Flakiness & Elongation index	Sample	607.00	
10.91	(Rock Test) Determination of Slake Durability of Rock	Sample	857.00	
	(XII) Steel Bar Testing			
10.92	(a) Tensile Testing	Sample	1054.00	
	(b) Elongation Testing	Sample	1054.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	(c) Yield Strength Testing	Sample	1054.00	
	(d) Bend Testing	Sample	1193.00	
	(e) Rebind Testing	Sample	1193.00	
	(f) Shear Strength of metal bar Testing	Sample	938.00	
	Part-B Hydraulic Model Studies			
10.93	Dismantling lime concrete or cement concrete in foundations or under floors, haunches or arches or terrace and also dismantling brick masonry including arches in lime or cement mortar and all other ancillary operations complete including all lead and lifts.	Cum	857.00	
10.94	Excavation in all kind of soft/ loose/ hard/ dense soils, moorum & moorum mixed with boulders and mud including dressing placing the excavated soil neatly in specified dump area or disposing off the same as directed, including cost of site clearance, all materials, machinery, labour and dressing etc. Complete with lead up to 200 m and lift (as per item 2.01 of chapter 2 of U.S.R.) add extra 20% due to small quantity for model and all other ancillary operations complete including all lead and lifts.	Cum	192.00	
10.95	Developing basin grid plan as per model scale including wooden pegs with top nails fixing it with mortar at specified levels as given in grid plan of the river or else supplied at different cross sections and all other ancillary operations complete including all lead and lifts.	Sqm	151.00	
10.96	Construction of rigid bed for model excluding walls including placing of muck in grid and profile up to desired levels with top layer 7.5 cm thick M15 cement concrete with graded metal of 20 mm size including 15 mm thick cement mortar 1:4 for developing profile for river basin above concrete floor and all other ancillary operations complete including all lead and lifts.	Sqm	550.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
10.97	Water charges for running model including energy charges, cost of operation and maintenance of pumps, losses and wastage and depreciation cost to pumps, pipe line and electrical system and all other ancillary operations complete including all lead and lifts.	Cumec/hour	6043.00	
10.98	Providing and spreading of 3 to 6 mm metal in downstream of energy dissipation arrangement for measuring scour pattern and scour depth in model for predicting scour depth in prototype of dam and all other ancillary operations complete including all lead and lifts.	Cum	1602.00	
10.99	Providing and spreading screened sand in downstream of energy dissipation arrangement for measuring scour pattern and scour depth in model for predicting scour depth in prototype of dam and all other ancillary operations complete including all lead and lifts.	Cum	1422.00	
10.100	Construction of crest profile, bucket/ stilling basin providing and fixing all necessary appurtenances like pier, chute block, baffle block, end sill in teak wood, including providing & fixing 4 mm dia. transparent plastic tubes as pressure tips wherever necessary for measuring the pressure at different positions of spillways and all the appurtenances along with piers and apron with neat cement plaster 15mm thick with 1:4 cement mortar including fixing of BM glass on the floor and all other ancillary operations complete including all lead and lifts.	Sqm	1411.00	
10.101	providing and fixing frame of steel work in single section including forging and hoisting, fixing in position etc. complete in angles (50x50x5 mm) in appropriate size as per requirement of sectional model flume and all other ancillary operations complete including all lead and lifts.	Kg	112.00	
10.102	Providing and fixing 12 mm thick transparent glass of (1200x900x12 mm) size of approved brand in frame of angles (50x50x5 mm) already fixed in the flume and all	Sqm	1960.00	

Item No.	Description of item	Unit	Rates	Remarks
1	2	3	4	5
	other ancillary operations complete including all lead and lifts.			
10.103	Construction of Gauge chamber with fixing 5 mm thick transparent glass fixed on side brick walls plastered and BM glass fixed at the bottom and laying PVC Pipe of 5 cm dia. to observe MWL and TWL and all other ancillary operations complete including all lead and lifts.	No.	2106.00	
10.104	(a) Photograph of running model (taken at site) of size 15cm x10 cm	No.	58.00	
	(b) Second copy of selected photograph of size 15 cm x10 cm	No.	29.00	
	(c) Videography of running model at site.	No.	4485.00	

CHAPTER-11

SPECIAL ITEMS OF WORKS

Instructions

1. General instructions on Schedule of Rates shall be applicable to the extent they are relevant.
2. Rates include:
 - a) Cost of labour.
 - b) Cost of running charges of machinery including fuel and lubricants.
 - c) Cost of all material required for execution of item of work.
 - d) All lead and lift of materials, machines and labours.
 - e) Wastage of Cement, Sand, Coarse Aggregate, Admixture, Concrete, Mortar, gabion box mesh, etc.
 - f) Shuttering, Scaffolding, Form work, Vibration, and Curing.
 - g) Mix design including testing of materials, quality assurance measures, inspection, etc.
 - h) Standard safety measures.
 - i) Site clearance, layout and setting out of work.
3. The rates of completed items are inclusive of loading and un-loading, standard finish required for concrete work and preparation of cold and hot joint.
4. All the construction materials, workmanship and quality shall conform to the standards prescribed in IS Codes, MORTH, ASTM and relevant Specification/ Guidelines/ Circulars of CG Water Resources Department.
5. This chapter covers special items needed during repairs/renovation/new constructions.
6. **Measurements:**
 - i) Dimensions shall be measured correct to the nearest centimeter. The area shall be calculated in sqm correct to two places of decimal and cubical contents in cubic meter correct to third places of decimal.
 - ii) No deductions shall be made for the following:
 - a) Volume occupied by reinforcement.
 - b) Opening up to 0.1 sqm in area.
 - c) Ends of dissimilar material for example beams, posts, girders, rafters, purlins, trusses, corbels and steps up to 0.5 sqm in cross section.
 - d) Opening up to 0.1 sqm in area (in calculating area of an opening, the thickness of separate lintel or sill shall be included in height). Volume occupied by pipes, conduits sheathing, etc., not exceeding 0.1 sqm each in cross sectional area.
7. The item no 11.09 to 11.12 shall be executed with prior written permission of the **Engineer-in- Chief** or concerned **Chief Engineer and Superintending Engineer BODHI**

CHAPTER-11
SPECIAL ITEMS OF WORKS
SCHEDULE OF RATES

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
11.01		Repair of spalled joint grooves of contraction joints, longitudinal joints and expansion joints in concrete structure using epoxy mortar or epoxy concrete including cost of raking and cleaning with wire brush or air and water jet, cost of all material, machinery, plant, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	M	1455.00	
11.02		Guniting rock or concrete surface with epoxy mortar of avg., 25 mm thickness having compressive strength equivalent to M35 including preparation of surface by sand blasting and cleaning, applying epoxy mortar with specified pressure with wire 3 mm GI wire mesh, finishing the surface etc. including cost of all material, machinery, T&P and labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete. For average 25 mm thick layer.	Sqm	1684.00	
11.03	11.03.1	Providing and inserting 12mm- 40mm nipples by drilling holes and fixing nipples with approved (fixing) compound as per standard procedure and specification including subsequent cutting/removal and sealing of holes after completion of grouting operation, including cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	Each	128.00	
	11.03.2	Sealing of cracks/ porous concrete by injection process with Cement Grout through nipples complete as per Technical Specification. The rates are inclusive of cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc.,	Kg	99.00	

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
		complete.			
	11.03.3	Sealing of cracks/porous concrete by injection process with Cement mortar Grout through nipples complete as per Technical Specification. The rates are inclusive of cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	Kg	95.00	
	11.03.4	Sealing of cracks/porous concrete by injection process with Epoxy Grout by volume through nipples complete as per relevant Technical Specification. The rates are inclusive of cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	Kg	1456.00	
11.04		Repair of damaged/deteriorated, leached, honey combed and spalled concrete surface with or without exposed steel reinforcement with epoxy mortar, Grade 3 and class C of ASTM having bond strength of 12 MPa and tensile strength of 16 MPa, average thickness of 10 mm and seal coat @ 1 Kg per 4m ² including cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete. For average 10 mm thick layer.	Sqm	864.00	
11.05		Repair of old, damaged exposed concrete/masonry surface by pre packed cement based polymer mortar of minimum strength of 45 MPa with 10 mm average thickness with application of curing compounds, initiator and promoter. The rates are inclusive of cost of all material, machinery, T&P, labour and cost of	Sqm	167.00	

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
		other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete. For average 10 mm thick layer.			
11.06		Epoxy bonding of new concrete to old concrete using epoxy resin painting suitable for dry and wet surface of the concrete with having minimum bond strength to concrete 2.5 MPa including preparation of old concrete surface with wire brush and compressed air, sealing of all cracks or spalling by epoxy injection of epoxy mortar or epoxy grouting as per requirement. Applying epoxy resin bond including cost of all material, machinery, T&P, labour and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	Sqm	856.00	
11.07		Repair of old damaged concrete with polymer concrete including removal of damaged concrete up to sound surface, preparation of surface by cleaning with wire brush/air and water jet, applying polymer concrete, finishing, curing etc. including cost of all material, labours, machinery, T&P and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete. For average 25 mm thick layer.	Sqm	1397.00	
11.08		Providing shotcrete on old damage concrete /masonry surface or on rock surfaces, comprising of cement, sand, coarse aggregates, water and quick setting compound in designed proportions having minimum density of 2000 kg/cum and strength not less than 25 MPa including preparation of surface by removal of old damaged concrete, cleaning by wire brush/ air/ water jet, including cost of all material, machinery, labour, T&P and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete. For average 40 mm thick layer.	Sqm	433.00	

Item No.	Description of Items	Unit	Rate	Remarks
1	2	3	4	5
11.09	<p>Providing UV resistant high strength, non-shrink polymer based repair mortar such as Poly Ironite Ceramic Cementitious (PICC) for joint filling in masonry of dams or hydraulic structures by a special type raised T-joint type filling to required depth with part cover on stone to a thickness of 10 to 15 mm and with 20 mm spread on the surface. For surface preparation by removing loose mortar inside the joints and removing loose masonry by breaking using manual and/or mechanical means, removing of existing embedded MS bar if any , cleaning the joints surface and inside of joints with special chemical for algae- fungi removal and protection with pressure water jet, applying a bond coat of special type of primer suitable to bond old to new concrete and concrete to rock for required bond strength before application of this mortar and then providing a water repellent top coat after finishing, complete as per specifications including materials, machinery, labour, scaffolding (special hanging platform), hire charges of cranes, insurance charges transportations directed by the Engineer-in- Charge.</p>	Sqm	2303.00	
11.10	<p>Providing UV resistant , non-toxic, high strength, non-shrink, polymer based cementitious repair mortar such as Poly Ironite Ceramic Cementitious (PICC) for resurfacing on damaged surfaces of concrete dams, masonry dams and colgrout faced dams and hydraulic structures to a thickness up to 10 to 15 mm or as per surface conditions and also treatment to the lift joints and honey combed areas, potholes etc., by removing loose material, particles, grout slurry, by breaking using manual and/or mechanical means, removing of existing embedded MS bar if any, cleaning the lift joints ,honey combing areas and surface with special chemical for algae- fungi removal and protection with pressure water jet, applying a bond coat of special type of primer suitable to bond old to new concrete and concrete to rock for required bond strength before application of repair mortar and providing a water repellent coat after finishing, complete as per specification including materials, machinery, labour, scaffolding with special hanging platform, hire charges of cranes, insurance charges</p>	Sqm	4534.00	

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
		transportation as directed by the Engineer-in-Charge.			
11.11		Strengthening of structural members like piers, beams, slabs, columns, etc. by Carbon Fiber Reinforce Polymers (CFRP) including excavation around piers up to the point of projection but not more than one meter below nalla bed level, dewatering, centering, shuttering, chipping, sand blasting, removal of dirt and grime built up wire mesh support wherever required, epoxy bonding and providing protective cover over CFRP as per standard practice , removing deteriorated mortar, concrete filling of patch spalls, air blasting including surface preparation, priming, putty application, resin application, finishing, painting including all required operation and all other ancillary operations including all lead and lift etc., complete.	Sqm	4500.00	
11.12		Grouting with micro fine cement grout mix of suitable consistency under specified grout pressure as directed in drilled holes by stage grouting method including cost of all materials, machinery, labour, re-drilling if necessary and all other ancillary operations including all lead and lift etc., complete.	Tonne	53835.00	
11.13		Providing, placing and laying of boulder apron laid in wire crates with 4 mm dia. GI wire conforming to IS 280 and IS 4826 in 100 mm x 100 mm mesh (woven diagonally) with 10 percent extra for laps and joints laid with stone boulders having least dimension not less than 200 mm & weight 25 Kg Each as per drawings and relevant technical specifications including cost of all material, machinery, labour, T&P and cost of other incidental charges and testing and all other ancillary operations including all lead and lift etc., complete.	Cum	2437.00	
11.14		Providing and laying M50 grade design mix concrete with Silica fumes or any other suitable additive using 20 mm graded aggregates clean, hard for RCC works of spillway crest, spillway d/s face, energy dissipating structures, training walls, piers, abutments and such other locations including cost of all materials, machinery, labour, formwork, centering, scaffolding,	Cum	8477.00	

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
		cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, T&P and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.			
11.15		Providing and laying M70 grade design mix concrete with Silica fumes or any other suitable additive using 20 mm graded aggregate clean , hard for RCC works of spillway crest, spillway d/s face, energy dissipating structures, training walls, piers, abutments and such other locations including cost of all materials, machinery, labour, formwork, centering, scaffolding, cleaning, batching, mixing, placing in position, levelling, vibrating, finishing, curing, T&P and cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.	Cum	9059.00	
11.16		Supplying and installation of Rubber Dam as per following size at Project site including supply of Rubber dam bladder, embedded parts, clamping arrangement, nozzles, blowers and associated valves, air supply pipe, water level and pressure sensors, control system as per water level and pressure sensors, control system as per technical specifications and excluding any type of civil work like excavation, concreting, reinforcement, dismantling of concrete, dewatering , raft, civil works of control room, machine foundation, electrical, DG, power connection and abutment work.			
		Height and length criteria			
		Height of Rubber dam (m)	Length Range (m)		
	11.16.1	2 to 2.9	30 -70	Sqm	705635.0 0
	11.16.2	3 to 3.9	30-60	Sqm	735896.0 0
	11.16.3	4 to 4.9	30 -50	Sqm	755815.0 0
	11.16.4	5 to 5.5	30-50	Sqm	779441.0 0

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
	Note: -	Height of Rubber Dam = Pond level – Crest level of Raft Length of Rubber Dam = Length of Span (from top of Rubber dam)			
11.17		Supply and installation of Gabion structure with mechanically Woven, metallic coated (galvanized with zinc in accordance with IS 4826) steel wire conforming to IS 280, Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes of required size, mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc coated, mesh wire diameter 3 mm, mechanically edged/selvedge with partitions at every 1 m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, dark brown rust not more than 5% after subjecting to neutral salt spray as per coda punch strength of 25 kN as per IS 16014:2018, IRC SP 116:2018 and MoRTH Clause 2500, abrasion resistant in accordance with ASTM A975, tying with lacing wire of diameter 2.2/3.2 mm (ID/OD), supplied @ 3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, including cost of all material, machinery, labour, T&P, cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.			
	11.17.1	Gabion box of size 2mx1mx1m	Cum	2921.00	
	11.17.2	Gabion box of size 3mx1mx1m	Cum	2711.00	
	11.17.3	Gabion box of size 4mx1mx1m	Cum	2605.00	
11.18		Supply and installation of Gabion structure with mechanically Woven, metallic coated (galvanized with zinc in accordance with IS 4826) steel wire conforming to IS 280, Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes of required size, mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc+ polymer (PVC,PA6,etc) coated, mesh wire			

Item No.		Description of Items	Unit	Rate	Remarks
1		2	3	4	5
		<p>diameter 2.7/3.7 mm (ID/OD), mechanically edged/selvedge with partitions at every 1 m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, Dark Brown rust (DBR) not more than 5% after subjecting to at least 3000 hours of neutral salt spray, with minimum tensile strength of 40kN/m and punch strength of 25 kN as per IS 16014:2018, IRC SP 116:2018 and MoRTH Clause 2500, abrasion resistant in accordance with ASTM A975, tying with lacing wire of diameter 2.2/3.2mm(ID/OD), supplied @ 3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, including cost of all material, machinery, labour, T&P, cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.</p> <p>Note: Coatings that exhibit no more than 5% DBR after extended hours of neutral salt spray exposure, comparable to the highest quality products available in the market, are more preferable.</p>			
	11.18.1	Gabion box of size 2m x 1m x 1m	Cum	3236.00	
	11.18.2	Gabion box of size 3m x 1m x 1m	Cum	3016.00	
	11.18.3	Gabion box of size 4m x 1m x 1m	Cum	2933.00	

Item No.	Description of Items	Unit	Rate	Remarks
1	2	3	4	5
11.19	<p>Supply and installation of Gabion structure with mechanically Woven, metallic coated (galvanized with zinc alloy in accordance with IS 4826) steel wire conforming to IS 280, Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes of required size, mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc+ 10% Al alloy+ polymer(PVC,PA6,etc.) coated, mesh wire diameter 2.7/3.7mm (ID/OD), mechanically edged/selvedge with partitions at every 1 m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, Dark Brown rust (DBR) not more than 5% after subjecting to at least 3000 hours of neutral salt spray ,with minimum tensile strength of 40 kN/m and punch strength of 25 kN as per IS 16014:2018, IRC SP 116:2018 and MoRTH Clause 2500, abrasion resistant in accordance with ASTM A975, tying with lacing wire of diameter 2.2/3.2mm (ID/OD), supplied @ 3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, including cost of all material, machinery, labour, T&P, cost of other incidental charges and testing as per relevant specifications and all other ancillary operations including all lead and lift etc., complete.</p> <p>Note: Coatings that exhibit no more than 5% DBR after extended hours of neutral salt spray exposure, comparable to the highest quality products available in the market, are more preferable.</p>			
11.19.1	Gabion box of size 2mx1mx1m	Cum	3488.00	
11.19.2	Gabion box of size 3mx1mx1m	Cum	3260.00	
11.19.3	Gabion box of size 4mx1mx1m	Cum	3175.00	

ANNEXURE-I

Quantity of Materials for Additional Lead Charges

Item No.	Description of Work	Quantity of materials required			
		Unit	Sand (cum)	Coarse Aggregate (Metal) (cum)	Rubble / Stone (cum)
(A)	Common Items (Plain/Reinforced Concrete)				
	M 15 using 150 mm max. size of CA	cum	0.38	0.97	
	M 15 using 80 mm max. size of CA	cum	0.377	0.98	
	M 15 using 40 mm max. size of CA	cum	0.428	0.877	
	M 15 using 20 mm max. size of CA	cum	0.479	0.785	
	M 20 using 150 mm max. size of CA	cum	0.38	0.97	
	M 20 using 80 mm max. size of CA	cum	0.415	0.845	
	M 20 using 40 mm max. size of CA	cum	0.375	0.835	
	M 20 using 20 mm max. size of CA	cum	0.418	0.765	
	M 25 using 40 mm max. size of CA	cum	0.40	0.765	
	M 25 using 20 mm max. size of CA	cum	0.408	0.765	
	M 30 using 20 mm max. size of CA	cum	0.41	0.68	
	M 35 using 20 mm max. size of CA	cum	0.41	0.68	
	M 40 using 20 mm max. size of CA	cum	0.41	0.68	
	M 45 using 20 mm max. size of CA	cum	0.41	0.68	
(B)	Stone Masonry				
3.30	Un-coursed and random rubble masonry	cum	0.42		1.00

3.31	CR Masonry	cum	0.38		1.00
3.32	Chisel Dressed/Hammer Dressed Masonry	cum	0.36		1.00
(C)	Chapter wise Items				
3.25	M20 CC20 mm for solid parapet	rm	0.101	0.184	
3.26	M20 CC20 mm for ornamental parapet	rm	0.088	0.161	
3.29	Porous Concrete (without Sand) body drain	cum	-	1.020	
3.33.1	Pointing in CM 1:2	sqm	0.008		
3.33.2	Pointing in CM 1:3	sqm	0.007		
5.33	Plastering in CM 1:3	sqm	0.025		
3.36	Rock fill embankment	cum			1.00
3.41	Trapezoidal longitudinal/cross drain	cum			
3.41.1	Sand	cum	1.00		
3.41.2	Metal	cum	-	1.00	
3.41.3	Rubble	cum			1.00
3.42	Filter blanket	cum			
3.42.1	Metal 80 mm nominal size	cum		1.00	
3.42.2	Metal 60 mm nominal size	cum		1.00	
3.42.3	Metal 40 mm nominal size	cum		1.00	
3.42.4	Metal 20 mm nominal size	cum		1.00	
3.42.5	Metal 10 mm nominal size	cum		1.00	
3.42.6	Shingle 80 mm or 60 mm nominal size	cum		1.00	
3.42.7	Shingle 40 mm nominal size	cum		1.00	
3.42.8	Shingle 20 mm nominal size	cum		1.00	

3.42.9	Shingle 10 mm nominal size	cum		1.00	
3.42.10	Sand Passing through 4.75 mm screen	cum	1.00		
3.44	Rock toe				
3.44.1	Boulder	cum			1.00
3.44.2	Quarried Stone				
3.44.2.1	Other than black trap, basalt or granite	cum			1.00
3.44.2.2	Black trap, basalt or granite	cum			1.00
3.46.1	22 cm thick dry-stone pitching	cum			1.00
3.46.2	30 cm thick dry-stone pitching	cum			1.00
3.46.3	45 cm thick dry-stone pitching	cum			1.00
3.47	22 cm thick dry picked up boulder pitching	cum			1.00
3.48	Stone chips under pitching	cum			1.00
3.49	Picked up boulder spalls under pitching	cum			1.00
3.51	Dump Rip Rap				
3.51.1	600 mm thick	sqm	0.204	0.204	0.60
3.51.2	750 mm thick	sqm	0.204	0.204	0.75
3.51.3	1000 mm thick	sqm	0.204	0.204	1.00
3.52	Hand Packed Rip Rap				
3.52.1	300 mm thick	sqm	0.153	0.153	0.3
3.52.2	450 mm thick	sqm	0.153	0.153	0.45
3.52.3	600 mm thick	sqm	0.153	0.153	0.6
4.02	Fine chisel dressed bed grade stone	each	0.053	0.10	
4.12	PCC Slab M-15 MSA-20				

4.12.1	60 mm Thickness	sqm	0.0442	0.0489	
4.12.2	50 mm Thickness	sqm	0.0395	0.0408	
4.12.3	40 mm Thickness	sqm	0.0350	0.0326	
4.13	Flag Stone Slab lining 40 mm to 50 mm	sqm	0.0140		Flag Stone (1sqm)
4.14	Stone Pitching lining in CM 1:3				
4.14.1	150 mm thickness	sqm	0.0034		0.150
4.14.2	225 mm thickness	sqm	0.0077		0.2250
4.14.3	300 mm thickness	sqm	0.1340		0.3000
4.17	610x610x975 mm deep filter drain pocket	each	0.16	0.16	
4.18.1	Filter drain (a) Sand	cum	1.00		
4.18.2	(b) Metal – 40 mm	cum		1.00	
5.20	Filling Foundation well with sand	cum	1.00		
5.22.1	Pumped Concrete Design Mix M 20	cum	0.44	0.66	
5.22.2	Pumped Concrete Design Mix M 25	cum	0.44	0.66	
5.22.3	Pumped Concrete Design Mix M 30	cum	0.44	0.66	
5.22.4	Pumped Concrete Design Mix M 35	cum	0.44	0.66	
5.22.5	Pumped Concrete Design Mix M 40	cum	0.44	0.66	
5.22.6	Pumped Concrete Design Mix M 45	cum	0.44	0.66	
5.25	150 mm PVC pipe weep holes	rm	0.0066	0.00267	
5.31	Flush mortar pointing CM 1:2	sqm.	0.0055		
5.32	Flush mortar pointing CM 1:3	sqm.	0.0065		
5.33	20 mm thick cement plastering CM 1:3	sqm.	0.0215		

5.34	20 mm thick cement plastering CM 1:4	sqm	0.0225		
5.36	Km Stone Type 2	each	0.0426	0.877	
7.04	50 mm thick guniting M 25	sqm	0.0178		
<u>Note - Quantity of water for per cum of: -</u>					
(i) Earth work - 90 litre					
(ii) Puddle work - 130 litre					
(iii) Concrete/ Masonry work - 180 litre					

ANNEXURE-II

Transportation Charges for Materials by Any Mode (Including Mechanical Means)

(Excluding loading and unloading charges)

Transportation charges are for general guidance only and for working out lead charge for specific requirement if any.

S. No.	Distance	Metal in Rs. / Cum	Earth/ Sand/Moorum in Rs. /Cum (90% of metal)	Rubble/ Size stone/ Cut stone/ Coarse aggregate in Rs. /Cum (140% of metal)	Cement/ Steel / Pipes/ AC & GI sheets/ RCC pole/CC block/Wood in Rs. / Tonne (90% of metal)	Water in Rs. / 1000 ltr.
1	Lead up to 50m (covered by item rate)		Initial lead	Initial lead	Initial lead	Initial lead
2	Lead up to 100 m	137.90	124.11	193.06	158.59	137.90
3	Add for every additional 25m lead up to 200m	19.20	17.28	26.88	22.08	19.20
4	Lead up to 200 m	217.10	195.39	303.94	249.67	217.10
5	Add for every additional 50m lead up to 0.50km	1.80	1.62	2.52	2.07	1.80
6	Lead up to 0.50 km	227.60	204.84	318.64	261.74	227.60
7	Add for every additional 0.50km lead up to 5km	16.60	14.94	23.24	19.09	16.60
8	Lead up to 5 km	376.60	338.94	527.24	433.09	376.60
9	Add for every additional 0.50km lead up to 10km	16.60	14.94	23.24	19.09	16.60
10	Lead up to 10 km	542.10	487.89	758.94	623.42	542.10
11	Add for every additional 1 km lead up to 30km	33.10	29.79	46.34	38.07	33.10
12	Lead up to 30 km	1204.10	1083.69	1685.74	1384.72	1204.10

13	Add for every additional 1 km lead up to 50km	33.10	29.79	46.34	38.07	33.10
14	Lead up to 50 km	1866.20	1679.58	2612.68	2146.13	1866.20
15	Add for every additional 1 km lead up to 100km	33.10	29.79	46.34	38.07	33.10
16	Lead up to 100 km	3521.40	3169.26	4929.96	4049.61	3521.40
17	Add for every additional 1 km lead beyond 100km	33.10	29.79	46.34	38.07	33.10

Lead for Hume Pipe (As per CSIDC):

- | | | |
|---|-----|----------------|
| 1. Transportation charges (up to 50km) | 24% | (cost of pipe) |
| 2. Transportation charges (above 50km and up to 100km) | 32% | (cost of pipe) |
| 3. Transportation charges (above 100km and up to 150km) | 35% | (cost of pipe) |
| 4. Transportation charges (above 150km and up to 200km) | 40% | (cost of pipe) |
| 5. Transportation charges (above 200km) | 48% | (cost of pipe) |

No loading and un-loading charges shall be added.

S. No.	Description of Items	Metal in Rs/ cum	Earth/ Sand/ Moorum in Rs. / Cum (90% of Metal)	Rubble/ Size Stone/ Cut Stone/ Coarse aggregate in Rs. / Cum (140% of Metal)	Cement/ Steel/ Pipe/ AC & GI sheet/ RCC pole/ CC Blocks in Rs. / Cum/ Tonne (90% of Metal)	Water in in Rs. / 1000/ Ltr
1	Loading	77.80	70.00	108.90	70.00	77.80
2	Unloading	112.80	101.50	157.90	101.50	Gravity

ANNEXURE-III

Items of Work to be taken from S.O.R. of other Department of Government Chhattisgarh:

S. No.	Item of Works Related to	S.O.R. to be referred
1	Building Works	P.W.D.
2	Brick Masonry	P.W.D.
3	Flooring	P.W.D.
4	Plastering	P.W.D.
5	Wood Work, Joinery, Steel/Rolling/ Collapsible Shutters, Grills etc.	P.W.D.
6	Ceiling and Wall Boarding	P.W.D.
7	Roofing	P.W.D.
8	R.C.C. Slab, Beams for building	P.W.D.
9	White/Colour washing, Distempering	P.W.D.
10	Painting	P.W.D.
11	Road Work	P.W.D./C.G.R.R.D.A.
12	Water Supply and tube well	P.H.E.
13	Sewerage & Drainage	P.H.E.
14	Sanitary Fittings	P.H.E.
15	Electrical Works: - Wiring & Cable Drawing, Accessories, Switches, Distribution, Fuse Boards & Bar Chambers, Fixing of IC Switch/Fuses, Maintenance Circuit, Earthing & Lighting, Conductor. External electrification - Fans, Fluorescent Tube Fittings, Mercury Vapor Fitting and Miscellaneous.	P.W.D.

ANNEXURE-IV

Statement of Rates for Materials -General Construction Material

General Guidelines –

- a) The rates for materials are excluding all taxes.
- b) The rates for materials shall be inclusive of royalty charges wherever applicable.

S.no.	Description of Material	Unit	Rate in Rs.
1	Acid resisting mortar mix	kg.	70.00
2	Acid resisting tiles	dozen	1359.00
3	Acrylic emulsion paint	Ltr	414.00
4	Asphalt 80 / 100 Grade and 85/25 Gr	Kg	49.00
5	Bentonite	tonne	3522.00
6	Binding wire	Kg	74.00
7	Burnt bricks	per nos	8.00
8	Burnt stone slab 10 cm thick	Sqm	450.00
9	Cement 43 Gr (including loading charges)	Kg	5.35
10	Cement concrete solid bricks	Each	59.00
11	Coal tar epoxy paint	Ltr	190.00
12	Coarse aggregate 10-4.75 mm (Data Rates)	Cum	940.00
13	Coarse aggregate 20-10 mm (Data Rates)	Cum	1218.00
14	Coarse aggregate 40-20 mm (Data Rates)	Cum	1079.00
15	Coarse aggregate 80-40 mm (Data Rates)	Cum	977.00
16	Concrete admixture (Super Plasticizer) per ltr	per lit	179.00
17	Coir brush	each	35.00
18	Copper sheet 16 SWG	kg	1193.00
19	Coursed rubble stone 300 x 300 x 450 mm	each	35.00
20	Coursed rubble stone 300 x 300 x 600 mm	each	45.00
21	Cross bit 100 mm dia. per No.	per nos	11998.00

22	Cross bit 50 mm dia. per No.	per nos	5440.00
23	Curing Compound	ltr	212.00
24	D – cord	m	15.00
25	De-greasing / de-rusting phosphate coating Chemical	ltr	396.00
26	Detonating fuse coil	m	10.00
27	Detonator delay type	each	10.00
28	Detonator electric	each	40.00
29	Detonator ordinary	each	4.00
30	Ductile iron pipe (18 kg / sqcm test pressure) 1000 mm dia.	Rm	31757.00
31	Ductile iron pipe (18 kg / sqcm test pressure) 1200 mm dia.	Rm	37766.00
32	Ductile iron pipe (18 kg / sqcm test pressure) 800 mm dia.	rm	30779.00
33	Empty cement bag	each	4.00
34	Explosive ANFO	kg	56.00
35	Explosive ANFO high strength booster	kg	70.00
36	Explosive small dia. (Kelvex-220 or equivalent)	Kg	52.00
37	Fine aggregate / sand (unscreened) (Data Rates)	Cum	801.00
38	Fine aggregate / sand (screened) (Data Rates)	Cum	1399.00
39	Geo-textile (filter fabric) 200 gsm	Sqm	223.00
40	Geo-textile (filter fabric) 250 gsm	Sqm	232.00
41	G I barbed wire 12 x 12 gauge	Kg	78.00
42	G I chain link mesh 10-gauge 50 x 50 mm opening	Sqm	124.00

43	G I Pipe 15 mm dia. A class	M	170.00
44	G I pipe 25 mm dia. A class	M	183.00
45	G I pipe 40 mm dia. B class	M	310.00
46	G I pipe 50 mm dia. A class	M	445.00
47	G I Pipe 80 mm dia. B Class	M	638.00
48	G I Pipe 100 mm dia. B Class	M	925.00
49	G.I sheet (corrugated) Class-II 1 mm thick	Tonne	69232.00
50	G.I sheet (plain) 0.63 mm thick	Tonne	64359.00
51	G.I Stretcher wire 8 gauge	Kg	179.00
52	Hariyala turfing sods	Sqm	35.00
53	Hectometer stone one line dressed	Each	276.00
54	Hemp yarn	kg	99.00
55	Honne wood planks	cum	64000.00
56	Hume pipe with collar 150 mm dia.	m	508.00
57	Hume pipe with collar 300 mm dia.	m	964.00
58	Ironite compound	kg	24.00
59	J- Bolts 300 mm long	each	67.00
60	Joint filler board 19 mm thick per sqm	sqm	634.00
61	Jungle wood planks	cum	31569.00
62	Kilometer stone one line dressed	cum	650.00

63	LDPE sheet(geo-membrane) 500 micron thick	sqm	156.00
64	LDPE sheet (geo-membrane) 750 micron thick	sqm	187.00
65	LDPE sheet (geo-membrane) 1000 micron thick	sqm	211.00
66	Maxphalt 80 / 100 Grade per kg	kg	57.00
67	M.S pipe 200 / 300 mm dia.	kg	185.00
68	M.S pipe 32 mm dia.	m	805.00
69	M.S Bolts and Nuts per kg	kg	91.00
70	Muroom (Data Rate)	cum	410.00
71	Oxalic acid	ltr	158.00
72	Plain glass 4 mm thick	sqm	534.00
73	Pre-stressed concrete pipe (18 kg / sqcm test pressure) 1000 mm dia.	M	7433.00
74	Pre-stressed concrete pipe (18 kg / sqcm test pressure) 1200 mm dia.	M	8776.00
75	Pre-stressed concrete pipe (18 kg / sqcm test pressure) 800 mm dia.	M	6126.00
76	PVC sealing strip	M	157.00
77	PVC water stopper 310 mm wide (central bulb type)	M	537.00
78	Rapid wire mesh 50 x 50 mm opening non-galvanized	Sqm	170.00
79	Reinforcement steel	Kg	62.00
80	Resin bond Cement capsule	Each	59.00
81	Rivets	Kg	94.00

82	Rolling shutter	Sqm	2972.00
83	Rolling shutter top cover	M	429.00
84	Rough stone 200 x 200 x 750 mm	Each	38.00
85	Size stone 150 to 200 mm height	Each	17.00
86	Size stone 200 to 250 mm height	Each	19.00
87	Size stone 250 to 300 mm height	Each	24.00
88	Shahabad stone slab (unpolished 25 to 40 mm thick)	Sqm	228.00
89	Shalimastic sealing compound	Kg	257.00
90	Steel door (frame and Shutter tubular sections)	sqm	8871.00
91	Steel door (frame CRCA sheet Shutter tubular sections)	sqm	5486.00
92	Steel window (tubular frame and tubular section shutter excluding glass)	sqm	3304.00
93	Steel window (tubular frame and Z section shutter excluding glass)	sqm	2372.00
94	Stone chips (at dump yard, including revised royalty)	cum	752.00
95	Stone chips (at quarry) (Data Rates)	cum	743.00
96	Structural steel angle / channel / beam / bars	kg	85.00
97	Structural steel plate / flats	kg	95.00
98	Super Plasticizer (Conplast RP-264 or equivalent)	ltr	129.00
99	Tar felt joint filler board 12 mm thick	sqm	148.00
100	Tar felt joint filler board 20 mm thick	sqm	217.00

101	Through stones 200 x 200 x 300 to 450 mm long	each	50.00
102	Through stones 250 x 250 x 450 to 600 mm long	each	60.00
103	Through stones 300 x 300 x 650 to 750 mm long	each	70.00
104	Un-coursed rubble stones (at dump yard, including revised royalty)	cum	701.00
105	Un-coursed rubble stones (at quarry) (Data Rates)	cum	660.00
106	Water proof cement paint	kg	38.00
107	Water proofing compound	kg	225.00
108	Weld mesh 100 x 50 mm 10 gauge non-galvanized	Sqm	249.00
109	Weld mesh 50 x 50 mm 13 gauge	Sqm	262.00
110	Wire mesh 20 gauge (chain link galvanized 50 mm x 50 mm opening)	Sqm	215.00

Statement of Rates for Materials - Gate and Allied works

S.no.	Particulars	unit	Rate
1	Acetylene gas	per cum	809.00
2	Alloy steel (Carbon steel IS 1570 Gr-202) Shafts	per kg	164.00
3	Alloy steel (Stainless steel IS 1304) for SS flats/plates	per kg	361.00
4	Bolt / Nut / Washer (hot dipped galvanized)	per kg	213.00
5	Bolt / Nut / Washer (Galvanized iron for general purpose)	per kg	241.00
6	Bolt / Nut / Washer (mild steel general purpose)	per kg	150.00
7	Bolt / Nut / Washer (counter shank type stainless steel as per IS 1570 for gates Gr-304)	per kg	719.00

8	Bolt / Nut / Washer (stainless steel as per IS 1570 for gates Gr-304 for general purpose)	per kg	492.00
9	Bolt / Nut / Washer (HT bolts nuts for gate purpose)	per kg	200.00
10	Bronze / Aluminum alloy (IS 305) Bearings / Bushes	per kg	440.00
11	Cast iron blocks	per kg	150.00
12	Cast steel Drums / Gears	per kg	200.00
13	Cast steel Pinions	per kg	300.00
14	Cast steel Wheels / Pulleys / Hubs / Rollers / Retainers	per kg	220.00
15	Chequerred Plate	per kg	131.00
16	Forged Steel Hooks / Shackles	per kg	250.00
17	Gas cutting set (2 No's 15 m hose and nozzle unit)	per unit	4823.00
18	Grease (Bearing grease)	per kg	273.00
19	Oxygen gas	per cum	137.00
20	Rails 30H/35H (30R/45R/30kg pm/45kg pm/52kgpm/60kg pm or equivalent)	Per kg	120.00
21	Rubber side seal-Size 75 x 33 x 12 mm (music note uncladed) IS 11855	per rm	1572.00
22	Rubber side seal-Size 100 x 44 x 14 mm (music note uncladed) IS 11855	per rm	950.00
23	Rubber side seal-Size 100 x 44 x 14 mm (music note Teflon claded) IS 11855	per rm	2100.00
24	Rubber side seal (Z - type) IS 11855 size 100 x 55 (or75) x 25 x 20 mm	per rm	2668.00
25	Rubber seal flat type -Size 75 x 12 mm (uncladed) IS 11855	per rm	804.00
26	Rubber bottom seal size 100 x 14 mm (flat type) IS 11855	per Rm	556.00
27	Rubber seal flat type -Size 150x20mm (uncladed) IS 11855	per rm	1508.00
28	Rubber corner seal size 100 x 44 x14 mm (music note Teflon claded) IS 11855—300 mm x 300 mm long size	per pair	3640.00

	pair		
29	Rubber side seal-Size 75x33x12 mm (music note Teflon clad) IS 11855	per rm	1895.00
30	Rubber seal (Z - type) IS 11855 size 150x75x35x20 mm (L-75/35 uncladded)	per rm	1700.00
31	Rubber side seal (Z - type) IS 11855 size 120x75x35x20 mm (L-75/35) uncladded	per rm	1500.00
32	Rubber corner seal size 100x44x14 mm (music note uncladded) IS 11856- 300 mm x 300 mm long size pair set of two pieces	per pair	1900.00
33	Stainless steel plate/flats IS 1570- Grade 304, equivalent for gates	per kg	305.00
34	Steel wire rope 6 x 37 or other construction as per IS 2266	per kg	950.00
35	Synthetic enamel paint (1st quality) for industrial use Berger K-70 Industrial enamel or equivalent	Per ltr	289.00
36	Welding electrodes 4 mm x 450 mm (MS general purpose) E-6013	per no	24.00
37	Welding electrodes 5 mm x 450 mm (MS general purpose) E-6013	per no	25.00
38	Welding electrodes 4 mm x 450 mm-CI (low hydrogen & alloy steel) E-7016	per no	36.00
39	Welding electrodes 4 mm x 450 mm (stainless steel) Chrome alloy, 309L	per no	44.00
40	Welding electrodes 3.15mm x 450 mm (stainless steel) Chrome alloy, 309L	per no	44.00
41	Welding electrodes 3.15mm x 450 mm-CI (low hydrogen & alloy steel) E-7016	per no	20.00
42	Welding holder 400 to 650 amps -Esab or equivalent	each	842.00
43	Welding cable 400 to 600 amps copper-Esab or equivalent	per m	685.00
44	Hand gloves set lather for Welding holder	each set	308.00

45	Wire brush 6"x3"	each	120.00
46	Zinc	per kg	800.00
47	Zinc rich (zinc content: 85 -90%) epoxy primer paint	per ltr	680.00
48	Zinc chromate red oxide primer (Berger -BR ROZC PRIM 2074 (PQ) or equivalent)	per ltr	355.00
49	Epoxy Thiner for Industrial paints (Berger -844 or equivalent)	per ltr	285.00
50	Disc spring	no's	209.00
51	Cast iron hoist body/lock nut/maunting Nut	kg	236.00
52	Black bituminous Black paint Berger or equivalent	Per liter	302.00
53	Cement primer Berger 079 BP cement primer super or equivalent	Per liter	387.00
54	Coaltar epoxy paint CTE black	Per liter	395.00
55	MS pipe 300mm dia./100mm dia.	kg	253.00
56	MS pipe 32mm dia.	kg	185.00
57	MS pipe 100mm dia.	kg	185.00
58	Rubber bottom seal size 75x12mm (flat type) IS 11855	m	353.00
59	Rubber side seal-Size 75x33x12 mm (music note without teflon cladded) IS 11855	m	700.00
60	Rubber side flat type bottom seal-size 150x20mm uncladded IS 11855	m	1261.00
61	Degreasing/Derusting/Phosphate Coating Chemical	Per ltr	230.00
62	Bolt/Nut/Washer (Stainless steel general purpose)	Per kg	492.00

ROYALTY CHARGES ON MATERIALS FOR THE YEAR 2017-18

As per Govt of CG Mining Department Gazette notification no. F-7-25/2012/12 Naya Raipur 5/3/2018

S. No.	Name of minor minerals	Area of applicability	Rate per Cum:
1	Muroom	Entire state	50.00
2	Ordinary sand/bajri	Entire state	50.00
3	Boulder	Entire state	130.00
4	Metal (Gitti /rocked metal)	Entire state	130.00
5	Chiseled stone/Masonry Stone/Finished stone	Entire state	130.00
6	Flagstone (natural layered stone)	Entire state	120.00
7	Dressed stone, khanda and dhoka	Entire state	130.00

ANNEXURE –V
LABOUR RATES AND DAILY WAGES

Notes:

1. (a) Labour rates, to be paid will refer to the class of work done and not to the person employed.

(b) The daily labour rates shall be arrived at by dividing the monthly rate by 30 and the quotient so arrived at after being rounded off to the next 10 paisa, shall be the daily rate exclusive of remuneration for weekly holiday. Hence separate payment shall be admissible for week- end-holiday.
2. The rates for skilled labour are inclusive of necessary tools which are normally carried by them, for carrying on their profession. The carpenter should bring all carpentry tools such as handsaw, pliers, square, drill, scale etc. mason should bring shovel, plumb bob thread and spirit level, bar bender should bring chisel and hammer, bar binder should bring pliers and wire twisting tool and artist should bring all required brushes for precision work. These examples are illustrative and not exhaustive.
3. The total wages payable to each labour on NMR shall be rounded off to the nearest rupees.
4. (a) The rates are for a working day of eight hours unless specified otherwise.
(b) In exceptional circumstances where work has to be continued beyond 8 hours in a day, the payment for over-time should be on hourly basis at double the hourly rate worked out from normal daily wages of 8 hours. Prior sanction of the Executive Engineer should be obtained, wherever possible, failing which urgent intimation should be given to the S.E./E.E. before the work is actually started. Written confirmation of EE's approval to the work should invariably be obtained from C.E./ S.E. immediately after the start of such emergent works.
5. The rates for hiring cart or truck on Km basis should be paid only when:
(a) The article or articles transported are not one full cart load (half - tonne) or one full truck load (seven-and-a-half-tonne) but are less than that too in emergency when departmental truck is not available, with the written permission of the Executive Engineer.
(b) Such articles are transported for which there is no rate available in the schedule of rates.
6. (a) Where more than one grade has been given, the Assistant Engineer is empowered to engage labour of Grade II and Grade III categories. For engagement of Grade, I category prior sanction of the Executive Engineer should be obtained.
(b) Grade-I, rates are for persons having experience of more than 5 years in the trade.

- (c) Grade-I Carpenter/Mason/Plumber shall be engaged for following works
Carpenter- For door/ window/ frames, shutters and similar types of work.

Mason - for cut stone work, first class brick masonry, face stone masonry (for dams) and similar types of work.

Plumber - for sanitary fittings, sewerage work and superior fittings.

- (d) For engaging Diver and Well Sinker prior sanction of the **Chief Engineer/Superintending Engineer** should be obtained.

7. Wherever monthly scales have been fixed by the State Government, the labour should be ordinarily employed for not more than one month but the period can be extended by the Executive Engineer up to 89 days beyond which approval of the **Chief Engineer/ Superintending Engineer** shall be necessary.
8. For underground works involved in tunnels, shafts, surge shafts, audits and drifts the rates of labour deployed should be up to 50% above the normal labour rates.
9. The daily labour rates, for various categories of labour provided in this chapter, shall be sanctioned by the Superintending Engineers for works under their circle within the limits of the revenue division in accordance with the rates, fixed from time to time by the committee, constituted by the State Government vide their labour department notification No.4/C/16/18 labour 16, dated 16-11-1978 under the chairmanship of divisional commissioner and shall be enforced from the date notified by the said committee.

The copy of the sanction may be endorsed in the Water Resources Department besides officers of another department as follows:

The Secretary, Water Resources Department, C.G.

Raipur. The concerned Chief Engineer.

The Superintending Engineer Bodhi, O/o Engineer-in-Chief, Water Resources Department, C.G., Raipur.

The Executive Engineers of the Circle (in 15 copies) for distribution to all concerned in division office.

All Sub-Divisional Officers (in 10 copies) for distribution to concerned staff including Sub- Engineers.

10. The following Acts of the Central Government with latest amendments thereto and rules made there under may be referred to:

- Minimum Wages Act, 1948
- Workman's Compensation Act, 1928
- Contract Labour (Regulation & Abolition) Act, 1970

STATEMENT OF WAGES OF WORKERS

As per labour Commissioner Chhattisgarh Raipur Order No
8/MW/LC/2024/6211 Naya Raipur dt 25/09/2024

S. No.	Category	Rate Per Day	Rate Per Month
1	Highly Skilled	486	12638
2	Skilled	456	11858
3	Semiskilled	426	11078
4	Unskilled	401	10428

I. HIGHLY SKILLED CATEGORY:	
1	Computer Operator
2	Diploma Engineer
3	Embankment Inspector
4	Geologist
5	Research Assistant
6	Stenographer
7	Technical Diploma and Equivalent Post etc.
II. SKILLED CATEGORY:	
1	Bar bender
2	Black smith / Tin smith / Rivetor
3	Blaster (Licensed)
4	Cook / Messman
5	Carpenter (Grade-I & Grade-II)
6	Diver with headgear
7	Electrician (Licensed)
8	Fitter (Grade-I & Grade-II) /Turner
9	Foreman (Mistry)
10	Graduate / Laboratory Assistant
11	Horticulture Assistant / Photographer
12	ITI certificate holder / Tracer / Printer
13	Mason / Brick layer (Grade-I & Grade-II)
14	Mechanic (Grade-I & Grade-II)
15	Operator Air compressor / DG set
16	Operator Batching plant
17	Operator Bus / Ambulance/ Lorry / Tanker
18	Operator Concrete / Asphalt mixer
19	Operator Concrete / Asphalt paver
20	Operator Concrete pump / Placer
21	Operator Core drilling machine
22	Operator Crane / Tower crane / Cable way
23	Operator Drilling jumbo / Loco / Winch

24	Operator Grouting / Guniting / Shotcreting
25	Operator Jackhammer/ Pneumatic tamper
26	Operator Pump / Ventilation fan
27	Operator Lathe/ Drilling/ Shearing machine
28	Operator Bending / Planning machine
29	Operator Road roller / Light vehicles
30	Operator Shovel / Scraper / Dozer/Hydraulic Excavator
31	Operator Spillway / Sluice gate
32	Operator Crusher / Conveyor / Mucker
33	Operator Tipper / Dumper / Transit mixer
34	Operator Concrete vibrator
35	Operator Vibratory plain / padfoot roller
36	Operator Wagon drill / Drifter
37	Painter (Grade-I & Grade-II)
38	Plumber (Licensed) / Pipe fitter
39	Spun pipe moulder
40	Struct. steel Fabricator / Marker / Erector
41	Surveyor
42	Stone Chiseler/Stone Cutter (Grade-I)
43	Welder / Gas Cutter
44	Wireman
III. SEMI SKILLED CATEGORY:	
1	Asphalt Sprayer / Boiler attendant
2	Boatman with Boat
3	Care-taker / conductor / Lift attender
4	Cartman with double bullock cart
5	Cartman with single bullock cart
6	Chavali / Navagani
7	Crowbar man / Jumper man
8	Erector shuttering
9	Floor Polisher / Tile Layer
10	Fitter Electrical
11	Gauge reader
12	Helper Air compressor / DG set
13	Helper Batching plant
14	Helper Blasting
15	Helper Bus / Ambulance / Lorry / Tanker
16	Helper Bending /Shearing /Planning machine
17	Helper Concrete / Asphalt mixer
18	Helper Concrete / Asphalt paver
19	Helper Core drilling machine

20	Helper Crane / Tower crane / Cable way
21	Helper Drilling jumbo / Loco / Winch
22	Helper Fitter / Fabrication
23	Helper Grouting / Guniting / Shotcreting
24	Helper Jack hammer / Pneumatic tamper
25	Helper Laboratory / Instrumentation
26	Helper Road roller
27	Helper Shovel / Scraper / Dozer/Hydraulic Excavator
28	Helper Crusher / Conveyor / Mucker
29	Helper Tipper / Dumper / Transit mixer
30	Helper Vibrator
31	Helper Vibratory plain/ padfoot roller
32	Helper Wagon drill/ Drifter
33	Literate mazdoor
34	Lineman Electric / Telephone
35	Patkari / Neeraganti / Sowdy
36	Stone Chiseler / Stone Cutter (Grade-II)
37	Stone breaker / Hammerman
38	Telephone / Wireless Operator
39	Typist
40	Valve man / Canal sluice operator
IV. UN-SKILLED CATEGORY:	
1	Bhisti
2	Cement / Asphalt handling mazdoor
3	Civic worker
4	Dhobi
5	Gangman / Head / Survey mazdoor
6	Gardener / Trained mali
7	Helper Carpenter
8	Mazdoor (Heavy/Light)
9	Sweeper
10	Watchman

ANNEXURE-VI

TECHNICAL TIPS

	One day in MCM	One month in MCM	One year in MCM
1 Cusec per day	1/408.83	0.073	0.893
1 Cumec per day	0.0864	2.59	31.54

- For 1 cusec per day round the year 1 sq. mile catchment area is required.
- For 1 cumec per day round the year 35 sq. mile catchment area is required.
- One Sq. Mile catchment storage scheme- Irrigation-about 200 ha.
Kharif or 170 ha. Rabi or 131 ha. perennial crop is generally irrigated.
- Velocity in ft/sec is approximately equal to – Velocity in km/hr.
- One square mile catchment gives about 1 Mcum yield.
- One Square mile catchment may provide drinking water to 20000 (0.20 Lakh) persons for whole year.
- Live storage in MCM= $K/200 + R/170 + P/131$ where K= Kharif, R= Rabi, P= Perennial area in hectares. (For storage tanks)
- 1 Mgd = 1/222.233 Mcum. per day or 0.135 Mcum per month or 1.62 Mcum per year/36000persons.
- 1 Mld = 1/1000 Mcum per day or 0.03 Mcum per month or 0.365 Mcum per year/8000 persons.
- 1 Mgd = 1/19.2 Cumec per day or 1.84 Cusec per day.
- For 1 mgd requirement 1.84 sq. mile catchment is required.
- For 1 mld requirement 0.41 sq. mile catchment is required.
- 1 mld can provide water to 8000 population.
- 1 mgd can provide water to 36000 population.
- 1 Mcum storage can provide drinking water to 20000 population.
- Plan yearly target assuming 150 working days.
- Irrigation from STOP DAM $AD = HFL(M)^{0.75}/(10)^5$ where A= Maximum permissible designed irrigation in hectare; H= Average water depth in Meters at the upstream face of the Stop Dam; F= Back water length; L= Effective length of Stop dam (water surface length); M= Catchment area in Sq.km. (Value of M should not be taken more than 100)

CONVERSION TABLE

One	Inch	is equal to 2.54 cm
One	foot	is equal to 0.3048 meter
One	mile	is equal to 1.609344 Kilometers
One	Square Kilometer	is equal to 100 hectares
One	cm.	is equal to 0.393701 inch
One	meter	is equal to 3.28084 Feet
One	kilometer	is equal to 0.621371 Mile
One	square inch	is equal to 6.4516 sq. cm
One	square feet	is equal to 929.0304 sq. cm.
One	square mile	is equal to 2.58999 sq. km.
One	Acre	is equal to 0.404686 Hectare
One	Acre	is equal to 43560 sq. feet
One	Sq. cm.	is equal to 0.155 sq. inch
One	sq. mile	is equal to 640 Acres
One	sq. meter	is equal to 10.7639 sq. feet
One	sq. km.	is equal to 0.386102 sq. mile
One	hectare	is equal to 2.47105 Acres
One	cft.	is equal to 0.0283168 cum
One	cft.	is equal to 6.2347 gallons
One	cft.	is equal to 28.31 Liters
One	imperial gallon	is equal to 4.54069 Liters
One	imperial gallon	is equal to 0.1604 cft.
One	cum.	is equal to 35.3147 cft.
One	cum.	is equal to 220.23 gallon
One	litre	is equal to 0.219969 gallon
One	litre	is equal to 0.035 cft.
One	Pound (lb)	is equal to 0.453592 kg.
One	Ton	is equal to 1.01605 Tonne
One	Kg.	is equal to 2.20462 Pound
One	Tonne	is equal to 0.984207 Ton
One	Kilogram	is equal to 9.807 Newton
One	Newton	is equal to 0.102 Kilogram

Pressure:

One	Pound per sq. ft.	is equal to	4.88243 kg. per sqm.
One	Pound per sq. inch	is equal to	0.0703070 kg. per sq. cm.
One	Ton per sq. ft.	is equal to	10.9366 tonne per sq. m.
One	Newton per sq. m.	is equal to	0.101972 kg per sq. m.
One	Kg. per sq. m.	is equal to	0.202816 pound per sq. ft.
One	Kg. per sq. m.	is equal to	0.001422 pounds per sq. inch
One	Kg. per sq. m.	is equal to	9.80665 Newton per sq. m.
One	MPa	is equal to	101971.621 Kg. per sq. m.
One	MPa (Mega Pascal)	is equal to	10^6 Newton/m ²
One	Pascal	is equal to	1 Newton/sqm
One	Pascal (Pa)	is equal to	0.101972 Kg. per sq. m.

Generalized conversion:

1 Newton/mm² (1N/mm² is equal to 10 kg/cm²).

Hence M 150 grade of concrete is now written as M 15 concrete in S.I. units.

Miscellaneous:

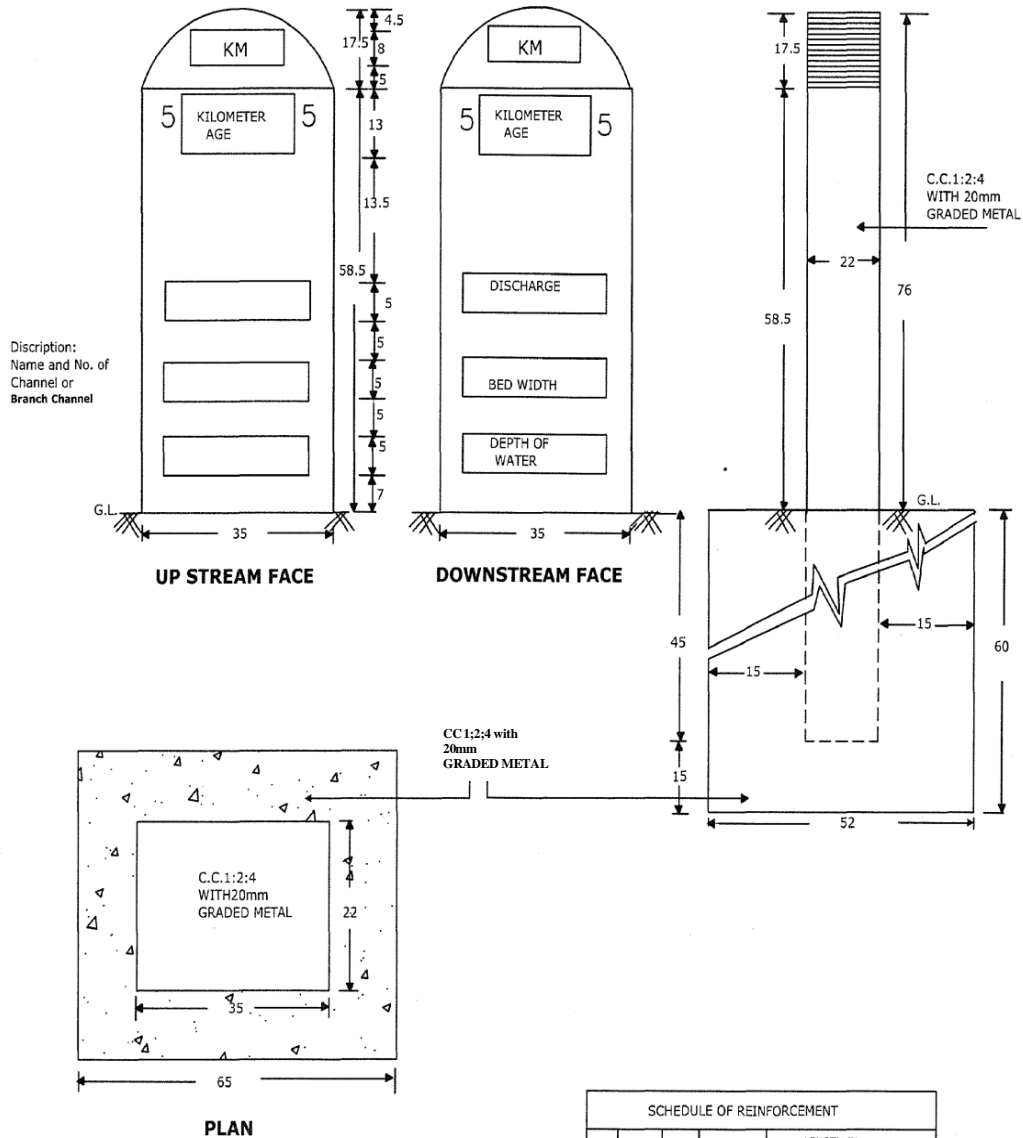
One	T.M.C. (Thousand Million Cubic ft.)	is equal to	28.31 MCM
One	T.M.C.	is equal to	2831 Hectare meter
One	Acre ft.	is equal to	0.123348 Hectare meter
One	Hectare Meter	is equal to	8.1071 Acre ft.
One	Hectare Meter	is equal to	0.00035 T.M.C.
One	Cusec day	is equal to	1.98 Acre ft. per day
One	Cusec day	is equal to	86400 cft. per day
One	Cusec day	is equal to	0.0024 MCM per day (1/408.83 MCM)

One	Acre-ft./day	is equal to	0.5042 cusec per day
One	Million cft./day	is equal to	11.57 cusec per day
One	Cumec	is equal to	86400 cum per day
One	Cumec	is equal to	0.0864 MCM per day
One	Cumec	is equal to	11.57 cumec per day
One	Lit./sec.	is equal to	0.035 cusec
One	Cumec	is equal to	70.06 Acre ft. per day
One	Cumec	is equal to	3.05 Mcft. per day
One	cusec	is equal to	28.31 litres per sec.
One	litre per second	is equal to	791.91 Gallons/hour
One	gallon per hour	is equal to	0.0012 litre/sec.
One	mgd. (Million gallons per day)	is equal to	1.86 cusecs per day
One	mgd.	is equal to	0.16 Mcft. Per day
One	MAF (Million Acre-ft)	is equal to	1234 MCM (Approx)
One	mgd.	is equal to	3.69 Acre-ft. per day
One	mgd.	is equal to	4540.69 cum per day
One	mgd.	is equal to	0.0526 cumec per day
One	mld (Million litres/day)	is equal to	0.001 MCM
One	mld	is equal to	0.365 MCM per year
One	mld	is equal to	0.22 mgd
One	mgd	is equal to	4.54 mld
One	cusec per day	is equal to	0.5376 mgd. (2.4411 mld)
One	Mcft per day	is equal to	6.236 mgd. (28.32 mld)
One	Acre-ft. per day	is equal to	0.271 mgd. (1.231 mld)
One	Mcum per day	is equal to	220.23 mgd. (1000 mld)
One	cumec per day	is equal to	19.0117 mgd. (86.40 mld)

Standard scales for different maps:

(1)	F.P.S. Topo sheets	1 inch =	1 mile
(2)	M.K.S. Topo sheets	1 cm. =	500 meters
(3)	District Map	1 inch =	4 Miles
(4)	Tahsil Map (Mazmuli)	1 inch =	2 Miles
(5)	Forest Topo sheets	4 inch =	1 Mile
(6)	Village map (Cadastral map)	1 inch =	330 Ft. (16 inch= 1 mile)
(7)	Canal 'L' section & Plan	V 1 cm. =	1 meter
		H 1 cm. =	30 meter
		Contour Interval -	0.5 m

ANNEXURE -VII **KILOMETER STONE** **TYPE DESIGN -2**



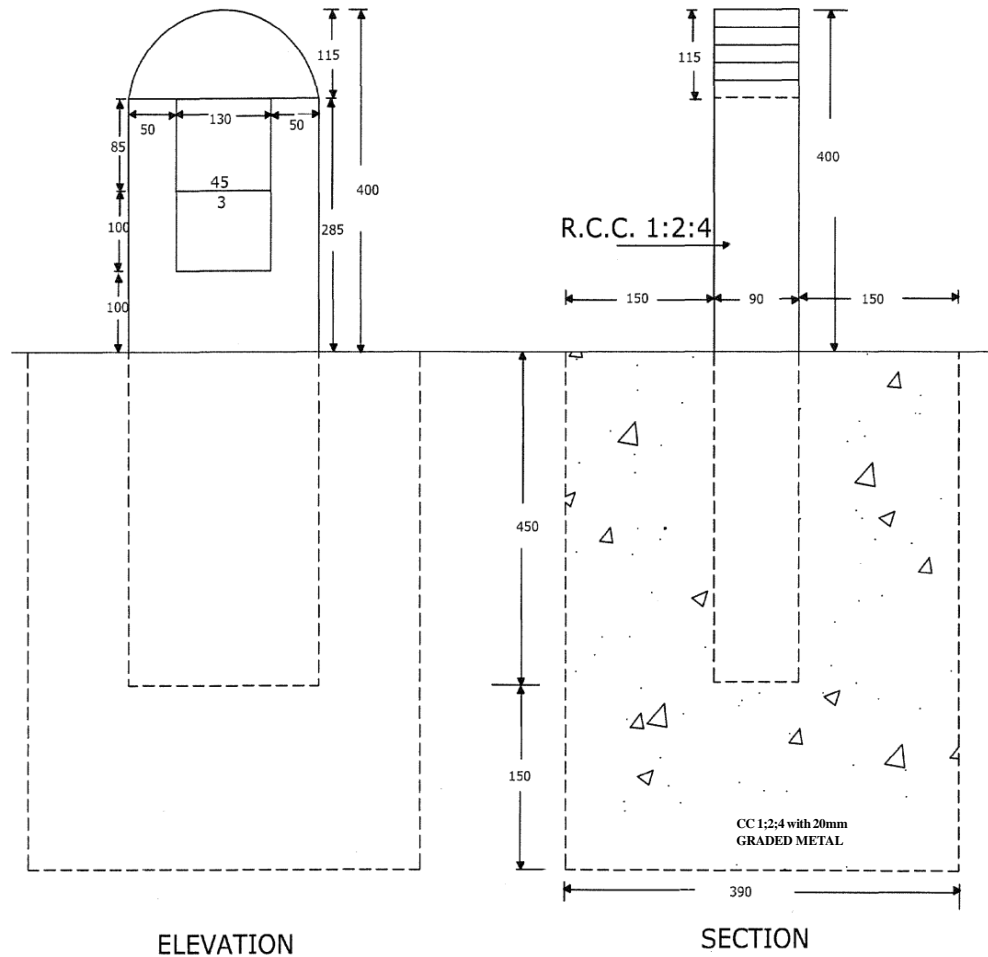
• NOT TO SCALE

SCHEDULE OF REINFORCEMENT						
BAR NO.	DIA IN mm	NO. OF BARS	SHAP OF BARS	LENGTH IN mm		
				EACH BAR	TOTAL	
1	10	2		2671	5342	
2	6	6		1144	6864	
				TOTAL Wt.	4.80 Kg.	

NOTE
 1 .All Dimensions in cm.
 2 .For all Chennals carrying Discharge more than 3 cumec.

ANNEXURE - VIII

0.2 KILOMETRE STONE TYPE DESIGN - 3



● NOT TO SCALE

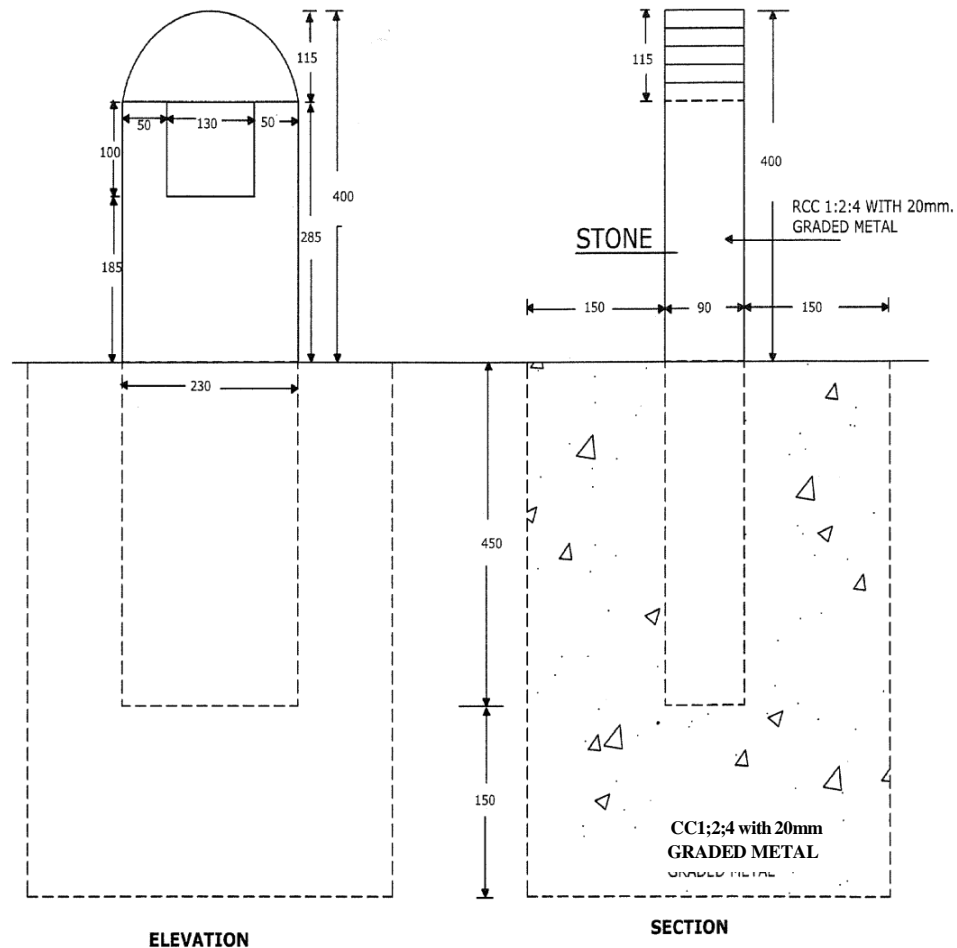
NOTE :-
SHALL BE NORMALLY FIXED AT
EVERY 200 METER ON CHENNAIS
CARRYING DISCHARGE OVER 0.3 cumec.

1/(18)

ANNEXURE -IX

CHAINAGE CUM BOUNDARY STONE

TYPE DESIGN - 4



NOT TO SCALE

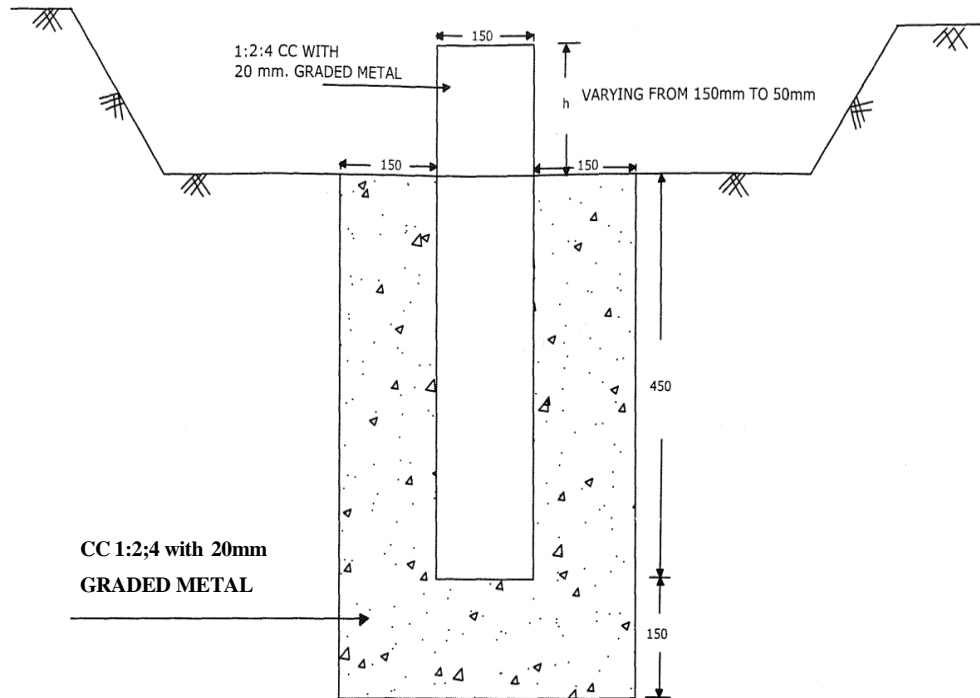
NOTE :-

SHALL BE USED AS CHAINAGE CUM BOUNDARY STONE FOR ALL IRRIGATION CHANNELS AND AS BOUNDARY STONES FOR DEMARCATING BOUNDARIES OF HEAD WORK BUILDING, QUARRIES Etc.

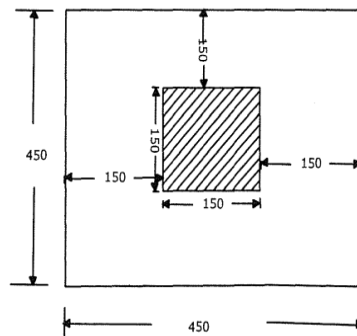
ANNEXURE -X

BED GRADE STONE

TYPE DESIGN -5



ELEVATION



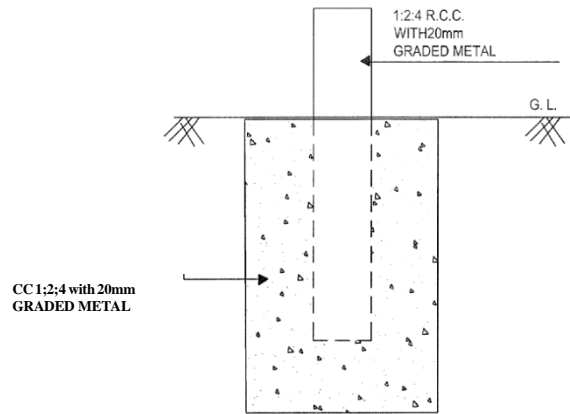
PLAN

NOTE:-

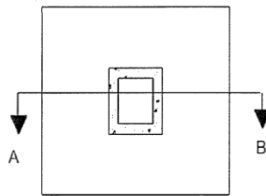
THE HEIGHT OF BED GRADE STONE ABOVE DESIGNED
BE LEVEL SHALL BE 15 cm FOR DISCHARGE ABOVE 3 cumec
10 cm FOR DISCHARGE FROM 0.50 TO 3 cumec
AND 5cm. BELOW 0.50 cumec.

ANNEXURE -XI



ORDINARY BENCHMARK TYPE DESIGN - 6



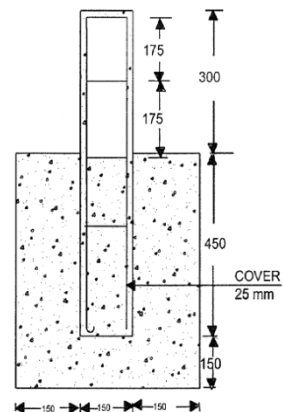
ELEVATION



PLAN

SCHEDULE OF REINFORCEMENT					
BAR NO.	DIA IN mm	NO. OF BARS	SHAP OF BARS	LENGTH IN mm	
				EACH BAR	TOTAL
1	6	2		1632	3264
2	6	3		496	1488
				TOTAL	4752

TOTAL Wt. = 1.05 Kg.
ALL DIMENSIONS IN mm



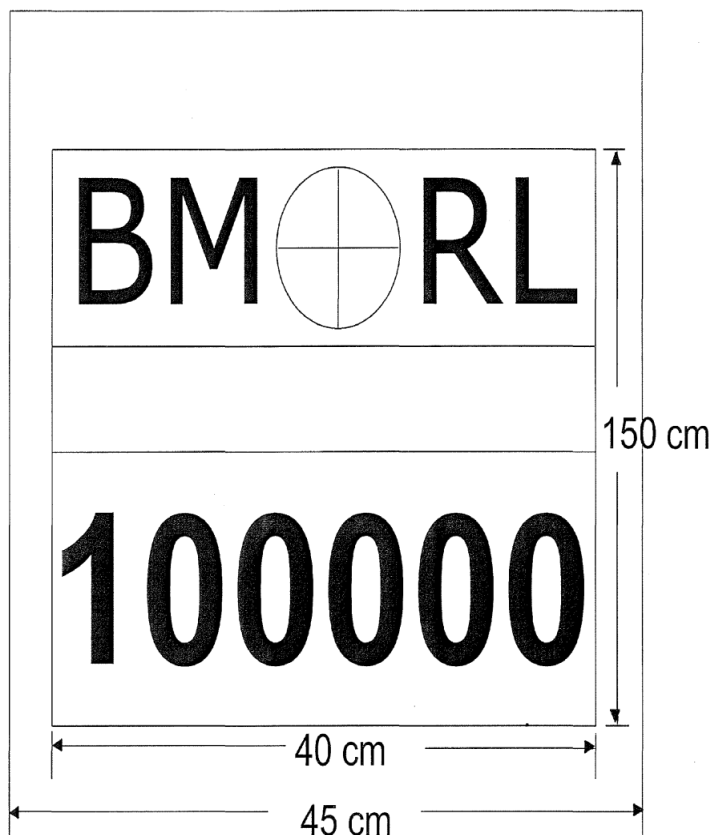
SECTION A-B

● NOT TO SCALE

ANNEXURE-XII

BENCH MARK ON MASONRY WORK TYPE

DESIGN - 7

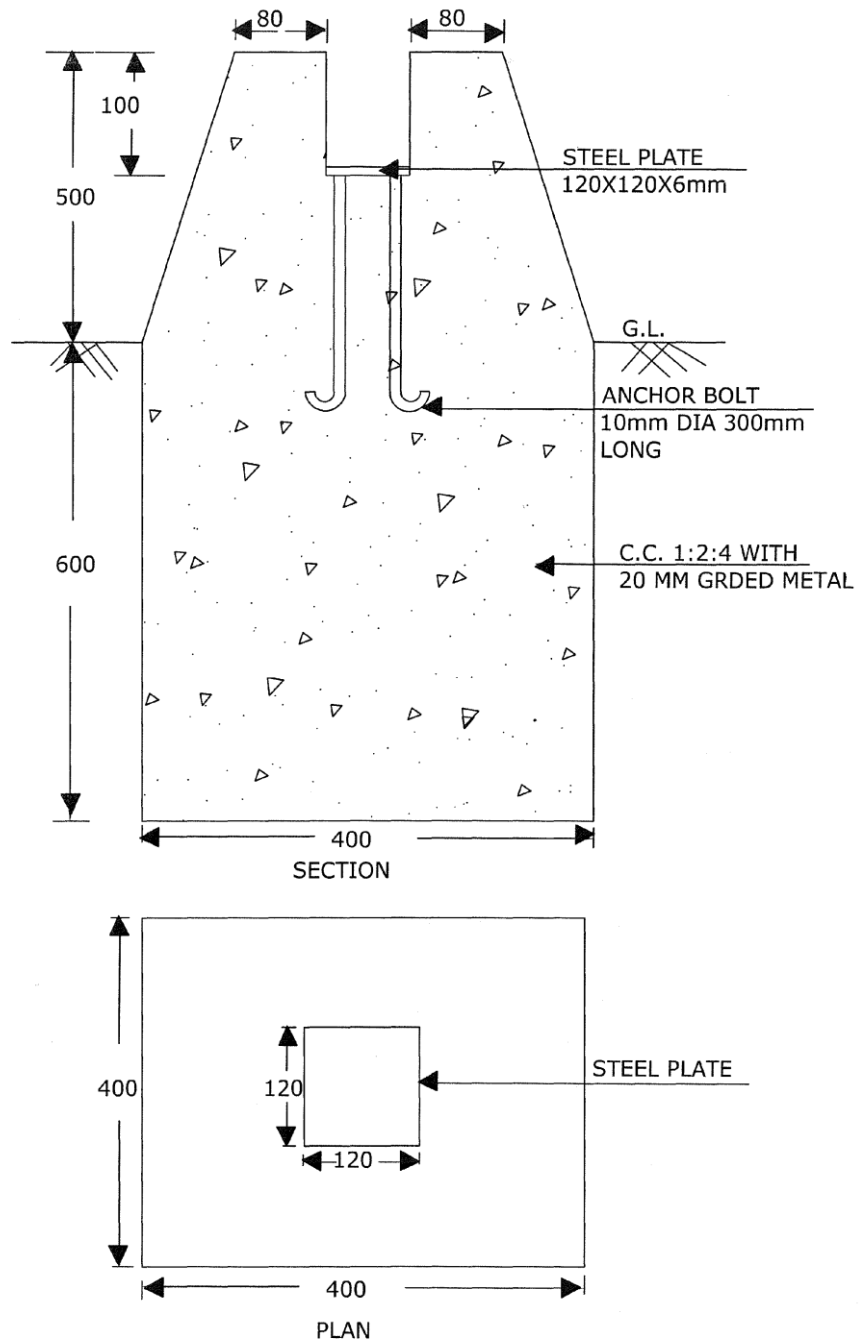


● NOT TO SCALE

BENCH MARKS ESTABLISHED ON MASONARY WORKS ARE INEXPENSIVE AND SERVE AS PERMANANT BM.
THESE MAY BE ESTABLISHED EITHER NEAR THE EDGE OR IN THE CENTER OR THE PARAPET CONSTRUCTED ON THE OUTER EDGE OF THE SERVICE ROAD.
BM'S SHOULD BE ESTABLISHED ON ALL IMPORTENT MASONARY WORK ON CANAL.
THERE SHOULD BE ATLEASD ONE BM AT EVERY KM. DISTANCE

ANNEXURE -XIII

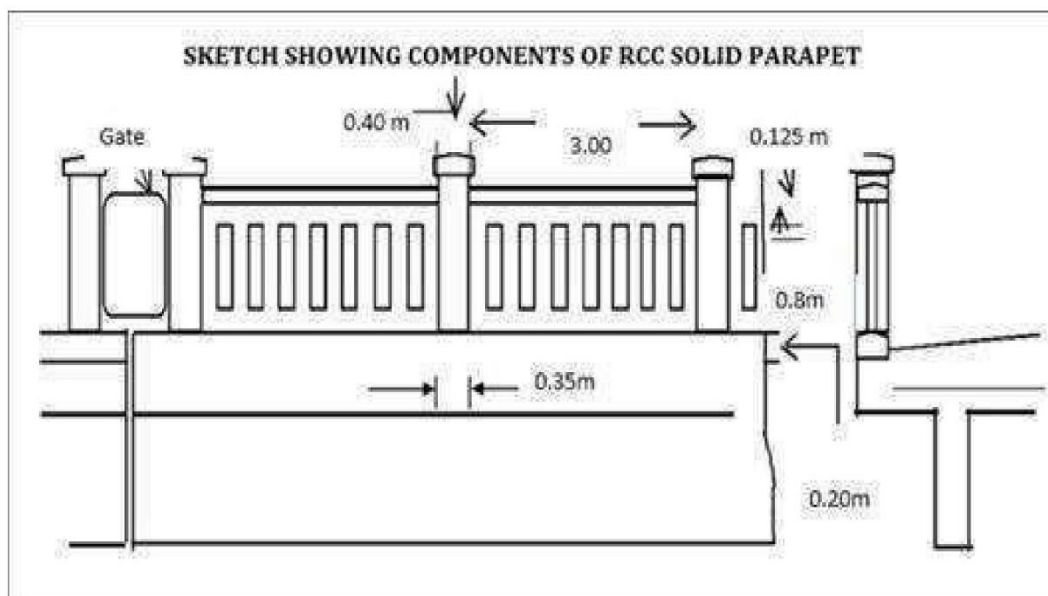
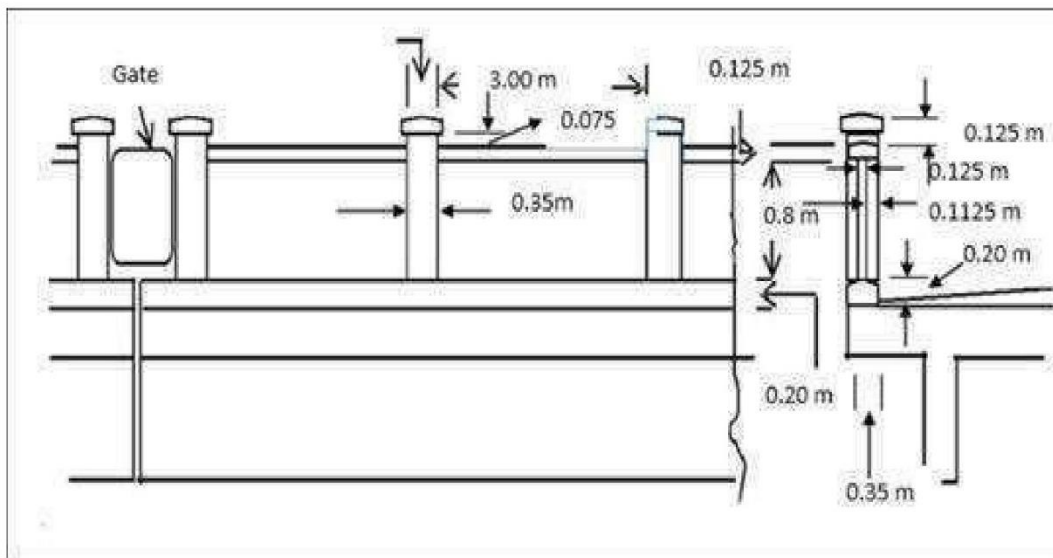
STANDARD BENCH MARK TYPE DESIGN - 8



NOT TO SCALE

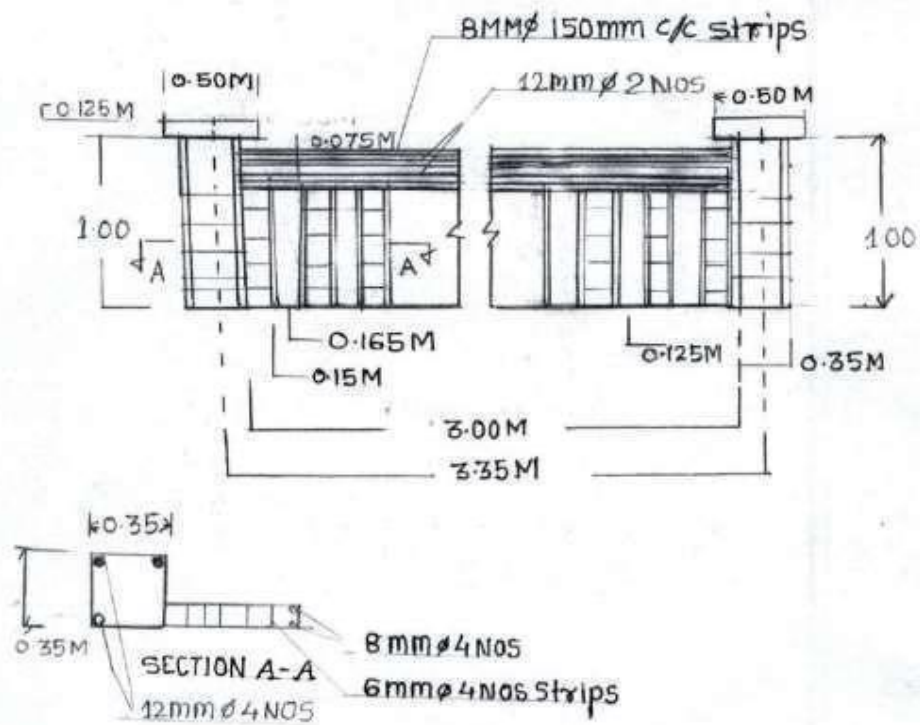
All dimensions in mm

ANNEXURE-XIV(A) **Drawing of Parapet Wall**



ANNEXURE -XIV(B)

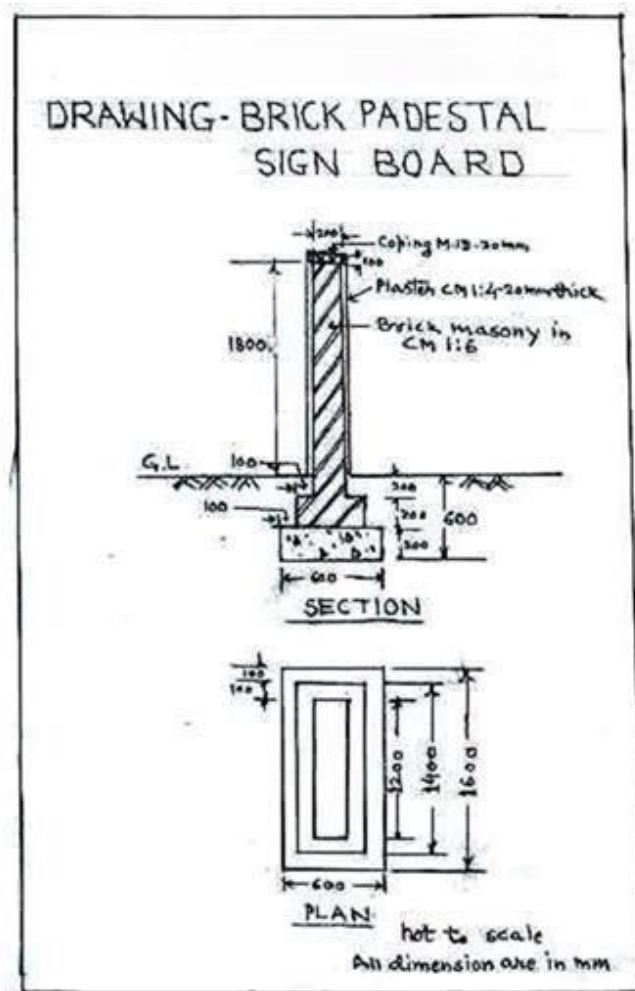
DETAILS OF REINFORCEMENT OF PARAPET WALL



• **NOTE** ÷

THE REINFORCEMENT SHOWN IN
DRAWING IS APPLICABLE FOR NORMAL
CONDITION FOR SITE SPECIFIC
REQUIREMENT THE REINFORCEMENT
IN RAILING SHOULD BE PROVIDED
AS PER DESIGN .

ANNEXURE -XV



ANNEXURE –XVI

OVERHEAD CHARGES

THE OVERHEAD CHARGES INCLUDE THE FOLLOWING ELEMENTS:

- a) Engineer and other technical staff for execution of work, site supervision & preparation of required documents.
- b) Site accommodation, setting up plant, access road, water supply, electricity and general site arrangements.
- c) Office furniture, equipment of resources.
- d) Expenditure on Corporate office of contractor, Sites supervision Documentation and “as built” drawings.
- e) Mobilization /de-mobilization of resources.
- f) Labour camps with minimum amenities and transportation to work sites.
- g) Light vehicles for site supervision including administrative and managerial requirements.
- h) Laboratory equipment and quality control including field and laboratory testing.
- i) Minor T&P and survey instruments and setting out works including verification of line, dimensions trial pits and bore holes wherever required.
- j) Temporary diversion with safety measures.
- k) Watch and ward.
- l) Traffic management during construction, expenditure on safeguarding.
- m) Insurance/ compensation.
- n) IT Charges including data entry of Progress Monitoring System, geotagging of every essential part of Head work, canal structures, irrigation schemes, chainage stone etc.

ANNEXURE-XVII

QUANTITIES OF MATERIALS FOR COMPLETED ITEMS OF WORK

Notes:

1. For items of works, which are not listed in this annexure, actual quantities should be worked out as mode of measurements specified in schedule of rates.

S. No.	Item	Unit	Material	Quantities of materials	Remark
1	Hard moorum filling	cum	Moorum	1.00 cum	
2	Rammed sand filling	cum	Sand	1.00 cum	
3	Rammed moorum & bolder	cum	Moorum	0.40 cum	
			Bolder	1.00 cum	
4	Rammed moorum and metal (or shingle or gravel).	cum	Moorum	0.33 cum	
			Metal	1.00 cum	
5	Cement mortar 1:2	cum	Cement	0.50 cum	
			Sand	1.00 cum	
6	Cement mortar 1:3	cum	Cement	0.33 cum	
			Sand	1.00 cum	
7	Cement mortar 1:4	cum	Cement	0.25 cum	
			Sand	1.00 cum	
8	Cement mortar 1:5	cum	Cement	0.20 cum	
			Sand	1.00 cum	
9	Cement mortar 1:6	cum	Cement	0.16 cum	
			Sand	1.00 cum	
10	Cement mortar 1:8	cum	Cement	0.12 cum	
			Sand	1.00 cum	
11	(a) Plum cement concrete 1:2:4 with 25% plums.	cum	Plum	0.21 cum	
			Metal	0.64 cum	
			Cement	0.16 cum	
			Sand	0.32 cum	
	(a) Plum cement concrete 1:3:6 with 25% plums.	cum	Plum	0.22 cum	
			Metal	0.68 cum	
			Cement	0.11 cum	
			Sand	0.34 cum	
	(b) Plum cement concrete 1:4:8 with 25% plums.	cum	Plum	0.23 cum	
			Metal	0.69 cum	
			Cement	0.09 cum	
			Sand	0.35cum	
12	Cement concrete 1:1:2	cum	Metal	0.77 cum	
			Cement	0.40 cum	
			Sand	0.38 cum	

S. No.	Item	Unit	Material	Quantities of materials	Remark
28	Stone block masonry with solid stone masonry block precast in c. c. 1:4:8	cum	Precast blocks	0.90 cum	
			Mortar	0.12 cum	
29	Sun dried brick masonry	cum	Bricks	1.00 cum	
			Mortar	0.25 cum	
30	Burnt brick masonry	cum	Bricks	1.00 cum	
			Mortar	0.21 cum	
31	Honey comb brick masonry	cum	Bricks	0.72 cum	
			Mortar	0.05 cum	
32	Flag stone flooring over 20 mm thick bedding of CM 1:6 including pointing in CM 1:3	sqm	Flag stone	1.10 cum	
			CM 1:6	0.0224 cum	
			CM 1:3	0.0026 cum	
33	Grouted stone pitching	cum	Pitching stone	1.00 cum	
			Mortar	0.20 cum	
34	Dry stone pitching	cum	Pitching stone	1.00 cum	
35	Dry Boulder pitching	cum	Boulder	1.00 cum	
36	75 mm thick improved terrace flooring in cement concrete with neat cement floating coat.	sqm	C.C.	0.075 cum	
			Cement (for Finishing and slurry)	0.003 cum	
37	40 mm thick improved terrace flooring in cement concrete with neat cement floating coat.	sqm	C.C.	0.04 cum	
			Cement (for Finishing and slurry)	0.003 cum	
38	15 mm thick lime plaster on brick masonry with neeru finish.	sqm	L.M.	0.025 cum	
			White wash Lime	0.003 cum	
39	20 mm thick lime plaster on brick masonry with neeru finish.	sqm	L.M.	0.025 cum	
			White wash Lime	0.003 cum	
40	Cement plaster on stone work-				
	(a) 20 mm thick	sqm	C.M.	0.025 cum	
	(b) 25 mm thick	sqm	C.M.	0.028 cum	
41	6 mm thick cement plaster to ceiling	sqm	C.M.	0.0072 cum	
42	Cement plaster on brick work-				
	(a) 10 mm thick	sqm	C.M.	0.012 cum	
	(b) 15 mm thick	sqm	C.M.	0.018 cum	
	(c) 20 mm thick	sqm	C.M.	0.022 cum	

S. No.	Item	Unit	Material	Quantities of materials	Remark
43	Rough cast Cement plaster-				
	(a) 15 mm thick	sqm	C.M.	0.02 cum	
	(b) 20 mm thick	sqm	C.M.	0.022 cum	
44	Cement for floating coat of neat cement over plaster.	sqm	Cement	2.20 kg	
45	Pebble dash plaster as per item 1124	sqm	C.M.	0.023 cum	
			6 to 12 mm pebbles or crushed stone	0.01 cum	
46	Pointing of brick work-				
	(a) Flush pointing	sqm	Mortar	0.003 cum	
	(b) Ruled pointing	sqm	Mortar	0.003 cum	
	(c) Raised and cut pointing	sqm	Mortar	0.0046 cum	
47	Pointing of brick work				
	(a) Flush pointing	sqm	Mortar	0.0023 cum	
	(b) Ruled pointing	sqm	Mortar	0.0023 cum	
	(c) Raised and cut pointing	sqm	Mortar	0.0038 cum	
48	Cement pointing to flag stone flooring	sqm	C.M.	0.0026 cum	
49	Mangalore tile roofing	sqm	Tiles	15 Nos	
50	A. C. sheets roofing	sqm	AC sheet	1.07 sqm	
51	White washing with lime				
	(a) One coat	sqm	Quick lime	0.1 kg	
			Indigo	0.3 gm	
			Gum	2.00 gm	
			Sodium Chloride	0.3 gm	
	(b) Two coat	sqm	Quick lime	0.2 kg	
			Indigo	0.6 gm	
			Gum	4.00 gm	
			Sodium Chloride	0.6 gm	
	(c)Three coat	sqm	Quick lime	0.3 kg	
			Indigo	0.9 gm	
			Gum	6.00 gm	
			Sodium Chloride	0.9 gm	
52	Cement wash with portland cement slurry	sqm	Cement	0.107 kg	

S. No.	Item	Unit	Material	Quantities of materials	Remark
53	White washing with Chalk whiting-				
	(i) One coat	sqm	Chalk	0.1 kg	
			Indigo	0.3 gm	
			Gum	2 gm	
			Copper sulphate	0.3 gm	
	(ii) Two coats	sqm	Chalk	0.2 kg	
			Indigo	0.6 gm	
			Gum	4 gm	
			Copper sulphate	0.4 gm	
	(iii) Three coats	sqm	Chalk	0.3 kg	
			Indigo	0.9 gm	
			Gum	6 gm	
			Copper sulphate	0.6 gm	
54	Distempering with dry distemper-				
	(a) One coat excluding priming Coat of whiting	sqm	Dry distemper	0.06 kg	
	(b) Two coats including priming Coat of whiting	sqm	Dry distemper	0.1 kg	
			Whiting chalk	0.1kg	
			Glue	4.0 gm	
	(c) Two coats excluding priming coat	sqm	Dry distemper	0.1 kg	
55	Distempering with oil bound washable distemper-				
	(a) One coat excluding priming coat	sqm	Oil bound distemper	0.10 kg	
	(b) Two coats including priming coat	sqm	Oil bound distemper	0.15 kg	
			Primer	0.018 liter	
	(b) Two coats excluding priming coat	sqm	Oil bound distemper		
56	Snowcem or Durocem-				
	(a) One coat	sqm	Snowcem	0.18 kg	
			Durocem		
	(b) Two coats	sqm	Snowcem	0.30 kg	
			Durocem		
57	Painting coat with ready mixed-				
	(a) Wood primer, pink (for hard & softwood).	sqm	Primer	0.075 liter	

S No.	Item	Unit	Material	Quantities of materials	Remark
	(b) Aluminum priming water resistant (for resinous wood and plywood).	sqm	Primer	0.075 liter	
	(c) Zinc chorme priming or red lead priming (for steel surface).	sqm	Primer	0.054 liter	
58	Painting two or more coats (excluding priming coat) on new surfaces with-				
	(a) Ready mixed paint (for wooden surfaces).	sqm	Paint	0.125 liter	
	(b)Ready mixed paint (for G.S. Sheets)	sqm	Paint	0.08 liter	
	(c) Aluminum paint	sqm	Paint	0.08 liter	
	(d) Enamel paint	sqm	Paint	0.10 liter	
59	Painting one or more coats on previously painted surface with				
	(a)Ready mixed paint (for wooden surfaces).	sqm	Paint	0.075 liter	
	(b)Ready mixed paint (for G.S. Sheets)	sqm	Paint	0.046 liter	
	(c) Aluminum paint	sqm	Paint	0.046 liter	
	(d) Enamel paint	sqm	Paint	0.061 liter	
60	Painting with ready mixed anti-corrosive bituminous black paint-				
	(a) Two or more coats on new Surfaces	sqm	Paint	0.095 liter	
	(b) One or more coats on previously painted surfaces	sqm	Paint	0.057 liter	
61	Painting with synthetic enamel paint-				
	(a) Two or more coats on new Surfaces	sqm	Paint	0.116 liter	
	(b) One or more coats on previously painted surfaces	sqm	Paint	0.07 liter	
62	Wall painting with plastic emulsion paint (excluding priming coat)-				
	(a) Two or more coats on new Surfaces	sqm	Paint	0.121 liter	
	(b) One or more coats on previously painted surfaces	sqm	Paint	0.073 liter	
63	Painting one or more coats with black Japan Paint.	sqm	Paint	0.07 litre	

S No.	Item	Unit	Material	Quantities of materials	Remark
64	Varnishing one or more coats with-				
	(a) Clear synthetic varnish	sqm	varnish	0.075 litre	
	(b) Copal varnish	sqm	varnish	0.07 litre	
65	Painting with oil type wood preservatives-				
	(a) Two or more coats on new Surfaces	sqm	Wood preservative	0.10 liter	
	(b) One or more coats on previously painted surfaces	sqm	Wood preservative	0.081 liter	
66	Oiling with linseed oil-				
	(a) Two or more coats on new Surfaces	sqm	linseed oil	0.116 liter	
	(b) One or more coats on previously painted surfaces	sqm	linseed oil	0.07 liter	
67	Seepage drains 60x60 cm-				
	(a) Filled with graded boulders or quarried stone.	m	Boulder	0.36 cum	
	(b) Filled in layers with boulders (or quarried stone) shingle and sand.	m	Boulder	0.09 cum	
			Shingle	0.112 cum	
			Sand	0.158 cum	
68	Seepage drains 60x60 cm-				
	(a) Filled with graded boulders or quarried stone.	m	Boulder	0.563 cum	
	(b) Filled in layers with boulders (or quarried stone) shingle and sand.	m	Boulder	0.14 cum	
			Shingle	0.174 cum	
			Sand	0.246 cum	
69	Filter blanket	cum	Graded metal or shingle or sand	1.00 cum	
70	Rock toe in earthen embankment	cum	Quarried stone or bould	1.00 cum	
71	45 cm thick stone pitching	sqm	Stone chips	0.45 cum	
				0.03 cum	
72	30 cm thick stone pitching	sqm	Stone chips	0.30 cum	
				0.021 cum	
73	90 cm thick stone pitching	sqm	Stone chips	0.90 cum	
				0.06 cum	
74	Fixing in position 1 mm thick and 355 mm wide annealed copper Sheet strips for contraction joints.	m	Copper Sheet	3.5 kg.	

S. No.	Item	Unit	Material	Quantities of materials	Remark
75	40 mm thick plaster for contraction joints.	sqm	Mortar	0.05 cum	
76	Providing dumped rip rap	cum	Rubble metal	0.65 cum 0.35 cum	
77	Fixing in position NP2 or NP3 Hume pipe in CM 1:3-				
	(a) 80 mm dia	each joint	mortar	0.001 cum	
	(b) 100 mm dia	each joint	mortar	0.0013 cum	
	(c) 150 mm dia	each joint	mortar	0.0016 cum	
	(d) 250 mm dia	each joint	mortar	0.0023 cum	
	(e) 300 mm dia	each joint	mortar	0.0033 cum	
	(f) 350 mm dia	each joint	mortar	0.0037 cum	
	(g) 400 mm dia	each joint	mortar	0.004 cum	
	(h) 450 mm dia	each joint	mortar	0.007 cum	
	(i) 500 mm dia	each joint	mortar	0.008 cum	
	(j) 600 mm dia	each joint	mortar	0.009 cum	
	(k) 700 mm dia	each joint	mortar	0.011 cum	
	(l) 750 mm dia	each joint	mortar	0.011 cum	
	(m) 800 mm dia	each joint	mortar	0.012 cum	
	(n) 900 mm dia	each joint	mortar	0.013 cum	
	(o) 1000 mm dia	each joint	mortar	0.015 cum	
	(p) 1100 mm dia	each joint	mortar	0.016 cum	
	(q) 1200 mm dia	each joint	mortar	0.018 cum	
78	Portland cement	cum	Portland cement	28.80 bags	

ANNEXURE - XVIII

AREAS AND WEIGHTS OF STEEL SECTIONS

(i) Round bars (IS 1732-1971)

Dia.	Weight per meter	Sectional area	Perimeter	Dia.	Weight per meter	Sectional area	Perimeter
mm	kg	sqm	cm	Mm	kg	sqm	cm
5	0.154	0.196	1.571	20	2.47	3.14	6.286
6	0.222	0.283	1.886	22	2.98	3.8	6.914
8	0.395	0.503	2.514	25	3.85	4.91	7.857
10	0.617	0.785	3.143	28	4.83	6.16	8.8
12	0.888	1.13	3.771	32	6.31	8.04	10.057
14	1.21	1.54	4.4	36	7.99	10.2	11.314
16	1.58	2.01	5.029	40	9.85	12.6	12.571
18	2	2.54	5.657				

(ii) Square bars (IS 1732-1971)

Side width	Weight per meter	Sectional area	Side width	Weight per meter	Sectional area
mm	kg	sqm	mm	kg	sqm
5	0.196	0.25	20	3.14	4
6	0.283	0.36	25	4.91	6.25
8	0.502	0.64	32	8.04	10.2
10	0.785	1	40	12.6	16
12	1.13	1.44	45	15.9	20.2
16	2.01	2.56	50	19.6	25

(iii) Flats (IS 1731-1971)

Width mm	Thickness mm							
	3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0
	Weight per meter length kg							
10	0.236	0.314	0.393	0.471	-	-	-	-
14	0.33	0.44	0.55	0.659	0.879	-	-	-
20	0.471	0.628	0.785	0.942	1.26	1.57	1.88	2.51
25	0.689	0.785	0.981	1.18	1.57	1.96	2.36	3.14
30	0.707	0.942	1.18	1.41	1.88	2.36	2.83	3.77
35	0.824	1.1	1.37	1.65	2.2	2.76	3.3	4.4
40	0.942	1.26	1.57	1.88	2.51	3.14	3.77	5.02
45	-	1.41	1.77	2.12	2.83	3.53	4.24	5.65
50	1.18	1.57	1.96	2.36	3.14	3.93	4.71	6.28
55	-	1.73	2.16	2.59	3.45	4.32	5.18	6.91
60	1.41	1.88	2.36	2.83	3.77	4.71	5.65	7.54
65	-	2.04	2.55	3.06	4.08	5.1	6.12	8.16
70	-	2.2	2.75	3.3	4.4	5.5	6.59	8.79
75	-	2.36	2.94	3.53	4.77	5.89	7.07	9.42
80	-	2.51	3.14	3.77	5.02	6.28	7.54	10
90	-	-	3.53	4.24	5.65	7.07	8.48	11.3
100	-	-	3.93	4.71	6.28	7.85	9.42	12.6
110	-	-	4.32	5.18	6.91	8.64	10.4	13.8
120	-	-	4.71	5.65	7.54	9.42	11.3	15.1
130	-	-	-	6.12	8.16	10.2	12.2	16.3
140	-	-	-	-	8.79	11	13.2	17.6
150	-	-	-	-	9.42	11.8	14.1	18.8
160	-	-	-	-	10	12.6	15.1	20.1
180	-	-	-	-	11.3	14.1	17	22.6
200	-	-	-	-	-	15.7	18.8	25.1
250	-	-	-	-	-	19.6	23.6	31.4
300	-	-	-	-	-	-	28.3	37.2

(iv) Equal Leg Angles

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
1	2	3	4	5
ISA 20 20	20x20	3	1.12	0.19
		4	1.45	1.10
ISA 25 25	25x25	3	1.41	1.10
		4	1.84	1.40
		5	2.25	1.80
ISA 30 30	30x30	3	1.73	1.40
		4	2.26	1.80
		5	2.77	2.20
IAS 35 35	35x35	3	2.03	1.60
		4	2.66	2.10
		5	3.27	2.60
		6	3.86	3.00
ISA 40 40	40x40	3	2.34	1.80
		4	3.07	2.40
		5	3.78	3.00
		6	4.47	3.50
ISA 45 45	45x45	3	2.64	2.10
		4	3.47	2.70
		5	4.28	3.40
		6	5.07	4.00
ISA 50 50	50x50	3	2.95	2.30
		4	3.88	3.00
		5	4.79	3.80
		6	5.68	4.50
		7	6.56	5.15
		8	7.41	5.82
ISA 55 55	55x55	5	5.27	4.10
		6	6.26	4.90
		8	8.18	6.40
		10	10.02	7.90

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
ISA 60 60	60x60	4	4.71	3.70
		5	5.75	4.50
		6	6.84	5.40
		8	8.96	7.00
		10	11.00	8.60
ISA 65 65	65x65	5	6.25	4.90
		6	7.44	5.80
		8	9.76	7.70
		10	12.00	9.40
ISA 70 70	70x70	5	6.77	5.30
		6	8.06	6.30
		7	9.40	7.30
		8	10.68	8.30
		10	13.02	10.20
ISA 75 75	75x75	5	7.27	5.70
		6	8.66	6.80
		8	11.38	8.90
		10	14.02	11.00
ISA 80 80	80x80	6	9.29	7.30
		10	15.05	11.80
		12	17.81	14.00
ISA 90 90	90x90	6	10.47	8.20
		8	13.79	10.80
		10	17.03	13.40
		12	20.19	15.80
ISA 100 100	100X100	6	11.67	9.20
		6.5	12.70	9.99
		8	15.39	12.10
		12	22.59	17.70
		15	27.90	21.90
ISA 110 110	110X110	8	17.08	13.40
		10	21.12	16.60
		12	25.08	19.70

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
		16	32.76	25.70
ISA 120 120	120X120	8	18.70	14.70
		10	23.20	18.20
		12	27.50	21.60
		15	33.90	26.60
ISA 130 130	130X130	8	20.28	15.90
		10	25.12	19.70
		12	29.88	23.50
		16	39.16	30.70
ISA 150 150	150X150	10	29.21	22.90
		12	34.77	27.30
		15	43.00	33.80
		16	45.65	35.80
		18	51.00	40.10
		20	56.21	44.10
ISA 180 180	180X180	15	52.10	40.90
		18	61.90	48.60
		20	68.30	53.70
ISA 200 200	200X200	12	46.94	36.90
		16	61.82	48.50
		20	76.38	60.00
		24	90.60	71.10
		25	94.13	73.90

(v) Unequal Leg Angles (I.S. :808(Pt-V)-1976)

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
1	2	3	4	5
ISA 30 20	30x20	3	1.41	1.10
		4	1.84	1.40
		5	2.25	1.80
ISA 40 20	40x20	3	1.73	1.36
		5	2.77	2.17
ISA 40 25	40x25	3	1.88	1.50
		4	2.46	1.90
		5	3.02	2.40
		6	3.56	2.80
ISA 45 30	45x30	3	2.18	1.70
		4	2.86	2.20
		5	3.52	2.80
		6	4.16	3.30
ISA 50 30	50x30	3	2.34	1.80
		4	3.07	2.40
		5	3.78	3.00
		6	4.47	3.50
ISA 60 30	60x30	5	4.29	3.37
		6	5.08	3.99
ISA 60 40	60x40	5	4.76	3.70
		6	5.65	4.40
		7	6.55	5.14
		8	7.37	5.80
ISA 65 45	65x45	5	5.26	4.10
		6	6.25	4.90
		8	8.17	6.40
ISA 65 50	65x50	5	5.54	4.35
		6	6.58	5.16
		7	7.60	5.96
		8	8.60	6.75

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
ISA 70 45	70x45	5	5.52	4.30
		6	6.56	5.20
		8	8.58	6.70
		10	10.52	8.30
ISA 75 50	75x50	5	6.02	4.70
		6	7.16	5.60
		7	8.31	6.53
		8	9.38	7.40
		10	11.52	9.00
ISA 80 50	80x50	5	6.27	4.90
		6	7.46	5.90
		8	9.78	7.70
		10	12.02	9.40
ISA 80 60	80x60	6	8.11	6.37
		7	9.38	7.36
		8	10.60	8.34
ISA 90 60	90x60	6	8.65	6.80
		10	14.01	11.00
		12	16.57	13.00
ISA 90 65	90x65	6	9.01	7.07
		7	10.40	8.19
		8	11.80	9.29
		10	14.60	11.40
ISA 100 50	100X50	6	8.73	6.85
		7	10.10	7.93
		8	11.40	8.99
ISA 100 75	100X75	6	10.14	8.00
		8	13.36	10.50
		10	16.50	13.00
		12	19.56	15.40
ISA 120 80	120X80	8	15.50	12.20
		10	19.10	15.00
		12	22.70	17.80

Designation	Size mm x mm	Thickness mm	Sectional area sq cm	Weight per meter Kg
ISA 125 75	125x75	6	11.66	9.20
		8	15.38	12.10
		10	19.02	14.90
		12	22.70	17.80
ISA 125 95	125X95	6	12.92	10.10
		8	17.04	13.40
		10	21.08	16.50
		12	25.04	19.70
ISA 135 65	135X65	8	15.10	11.80
		10	18.60	14.60
		12	22.10	17.30
ISA 150 90	150X90	10	23.20	18.20
		12	27.50	21.60
		15	33.90	26.60
ISA 150 115	150X115	8	20.71	16.30
		10	25.66	20.10
		12	30.52	24.00
		16	40.00	31.40
ISA 200 100	200X100	10	29.21	22.90
		12	34.77	27.30
		15	43.00	33.70
		16	45.65	35.80
ISA 200 150	200X150	10	34.29	26.90
		12	40.85	32.10
		15	50.50	39.60
		16	53.73	42.20
		18	60.00	47.10
		20	66.29	52.00

(VI) Channel [I.S. :808 (Pt. III)-1979]

Designation Kg	Weight per meter sqcm	Sectional area mm	Depth of section mm	Width of flange mm	Thickness of flange mm	Thickness of web mm
Mc 75	7.14	9.10	75	40	7.50	4.80
Mc 100	9.56	12.20	100	50	7.70	5.00
Mc 125	13.10	16.70	125	65	8.20	5.30
Mc 125*	13.70	17.50	125	66	8.10	6.00
Mc 150	13.80	17.50	150	75	9.00	5.70
Mc 150*	17.70	22.60	150	76	9.00	6.50
Mc 175	19.60	24.90	175	75	10.20	6.00
Mc 175*	21.70	27.60	175	77	10.20	7.50
Mc 200	22.30	28.50	200	75	11.40	6.20
Mc 200*	24.30	31.00	200	76	11.40	7.50
Mc 225	26.10	16.70	225	80	12.40	6.50
Mc 225*	30.70	17.50	225	83	12.40	9.00
Mc 250	30.60	21.30	250	80	14.10	7.20
Mc 250*	24.20	22.60	250	82	14.10	9.00
Mc 250*	38.10	22.60	250	84	14.10	11.00
Mc 300	36.30	24.90	300	90	13.60	7.80
Mc 300*	41.50	27.60	300	92	13.60	10.00
Mc 300*	46.20	28.50	300	94	13.60	12.00
Mc 350	42.70	31.00	350	100	13.50	8.30
Mc 400	50.10	22.60	400	100	15.30	8.80
McP 75	7.14	9.10	75	40	7.50	4.80
McP 100	9.56	12.20	100	50	7.70	5.00
McP 125	13.10	16.70	125	65	8.10	5.30
McP 125*	13.70	17.50	125	66	8.10	6.00
McP 150	16.80	21.30	150	75	9.00	5.70
McP 150*	17.70	22.60	150	76	9.00	6.50
McP 175	19.60	24.90	175	75	10.20	6.00
McP 175*	21.70	27.60	175	77	10.20	7.50
McP 200	22.30	28.50	200	75	11.40	6.20
McP 200*	24.30	31.00	200	76	11.40	7.50
McP 225	26.10	33.30	225	80	12.40	6.50

Designation Kg	Weight per meter sqcm	Sectional area mm	Depth of section mm	Width of flange mm	Thickness of flange mm	Thickness of web mm
McP 225*	30.70	39.00	225	83	12.40	9.00
McP 250	30.60	39.00	250	80	14.10	7.20
McP 250*	34.20	43.50	250	82	14.10	9.00
McP 250*	38.10	48.50	250	84	14.10	11.00
McP 300	36.30	46.30	300	90”	13.60	7.80
McP 300*	41.50	52.80	300	92	13.60	10.00
McP 300*	46.20	58.80	300	94	13.60	12.00
McP 350	42.70	54.40	350	100	13.50	8.30
McP 400	50.10	63.80	400	100	15.30	8.80

***Thick section**

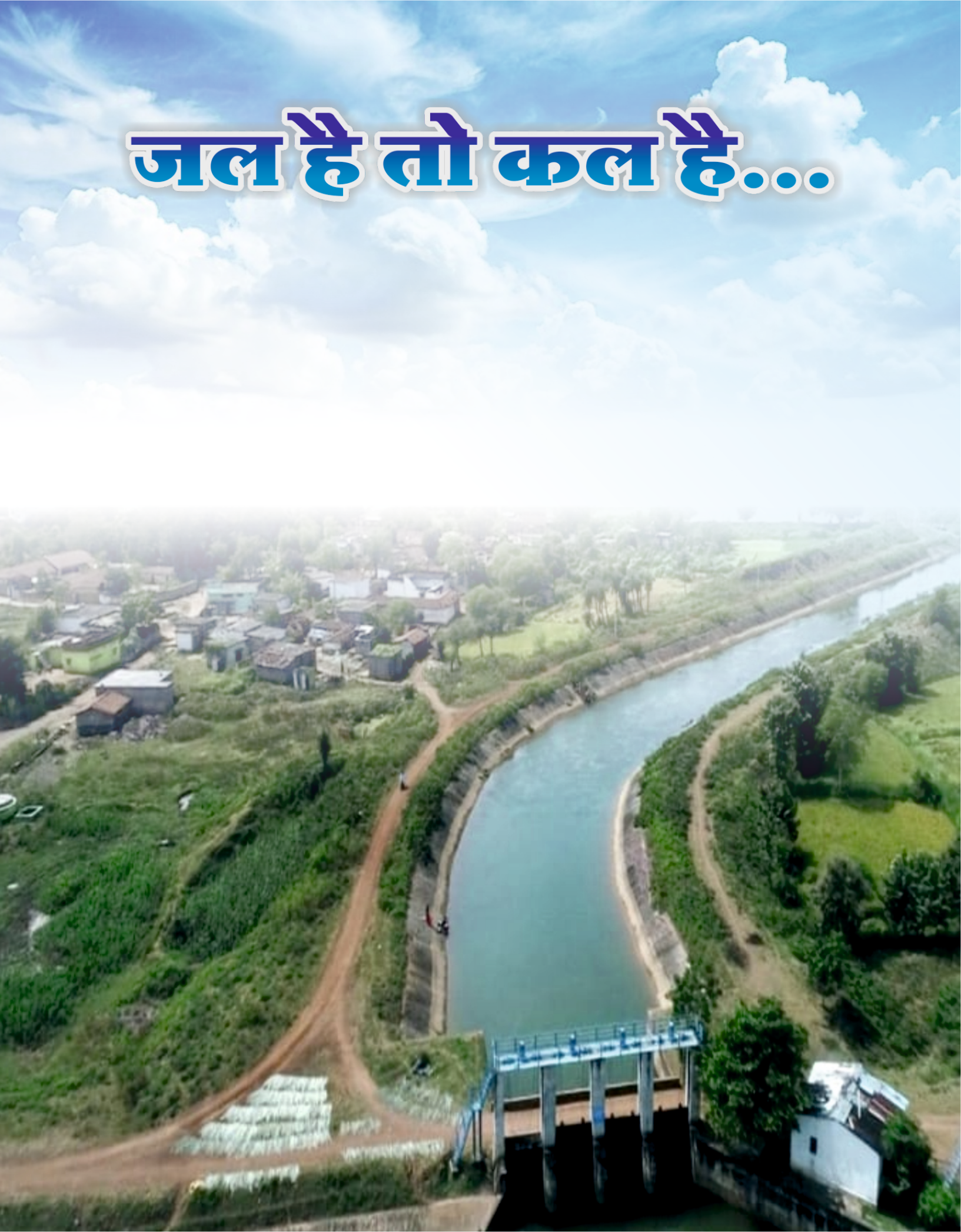
Hot Rolled Steel Beams [IS 808 (Pt. I)-1973]

Designation Kg	Weight per meter sqcm	Sectional area mm	Depth of section mm	Width of flange mm	Thickness of flange mm	Thickness of web
MB 100	11.50	14.70	100	70	7.50	4.50
MB 125	13.40	17.00	125	70	8.00	5.00
MB 150	15.00	19.10	150	75	8.00	5.00
MB 175	19.50	24.90	175	85	9.00	5.80
MB 200	25.40	32.30	200	100	10.80	5.70
MB 225	31.20	39.70	225	110	11.80	6.50
MB 250	37.30	47.60	250	125	12.50	6.90
MB 300	46.10	58.70	300	140	13.10	7.70
MB 350	52.40	66.70	350	140	14.20	8.10
MB 400	61.60	78.50	400	140	16.00	8.90
MB 450	72.40	92.30	450	150	17.40	9.40
MB 500	86.90	111.00	500	180	17.20	10.20
MB 550	104.00	132.00	550	190	19.30	11.20
MB 600	123.00	156.00	600	210	20.80	12.00

Hot Rolled Steel Columns [IS 808 (Pt. II)-1973]

Designation Kg	Weight per meter sqcm	Sectional area mm	Depth of section mm	Width of flange mm	Thickness of flange mm	Thickness of web
SC 100	20.00	2.55	100	100	10.00	6.00
SC 120	26.20	3.34	120	120	11.00	6.50
SC 140	33.30	4.24	140	140	12.00	7.00
SC 160	41.90	5.34	160	160	13.00	8.00
SC 180	50.50	6.44	180	180	14.00	8.50
SC 200	60.30	7.68	200	200	15.00	9.00
SC 220	70.40	8.98	220	220	16.00	9.50
SC 250	85.60	10.90	250	250	17.00	10.00

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लक्ष्मण झूला, महादेव घाट



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