

S.L. NO. 11

-806-

BEFORE THE NATIONAL GREEN TRIBUNAL,

EASTERN ZONE BENCH, KOKATA.

Original Application No.06 of 2016/EZ

IN THE MATTER OF:

Subhas Dutta

.....Applicant

Versus

State Of West Bengal and others

.....Respondents

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PAUSHALI BANERJEE

ADVOCATE

7A, KIRON SHANKAR ROY ROAD,

KOLKATA-700001



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EASTERN ZONE BENCH, KOKATA.



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.....Respondents

**AFFIDAVIT OF COMPLIANCE ON BEHALF OF KOLKATA METROPOLITAN  
DEVELOPMENT AUTHORITY .**

I, Tapash Roy , son of Late Nirendra Narayan Roy, aged about 59 years, by  
occupation- service, working for gain as Superintending Engineer( Gap), Gap  
Wing , W & S Sector , Kolkata Metropolitan Development Authority, having

office at Unnayan Bhavan , Block-DG, Sector- II, Salt Lake City, Kolkata- 700-091, do hereby solemnly affirm and state as under:-

1. That I am the Superintending Engineer (Gap), Gap Wing , W & S Sector , Kolkata Metropolitan Development Authority Government of West Bengal. I am well acquainted with the facts and circumstances of the case and I have been duly authorized to affirm this affidavit on behalf of the Kolkata Metropolitan Development Authority .

2. I say that in compliance of the order dated 30/09/21 of this Hon'ble Tribunal a committee was constituted to examine the DPR prepared the KMDA and the comments raised by Railways, I say the followings :

i. That a field survey was conducted by the Railways and KMDA on 9/10/21 Subsequently a meeting was held at DM/Howrah's office on 07.10.2021 where DM/Howrah requested for a joint verification of

Sewage generation considered in the DPR at site. The sewage generation has been verified and recorded in the joint verification report. The joint verification report dated 9/10/21 is annexed herewith and marked as Annexure A/1 (Annex – 5).

ii. That further Observations of Railway's submitted on 20.10.2021 and that has also been responded by the Chief Engineer, GAP



Wing/W&S Sector, KMDA dated-28.10.2021. The observations and response are annexed herewith and marked herewith and annexed as Annexure A/2 (Annex – 6)

- iii. The last meeting was held at the office of the District Magistrate, Howrah on 24.11.2021 where the Committee failed to reach any unanimous decision. The minutes of the meeting along with the joint inspection report dated 22/10/21 is annexed herewith and marked as Annexure A/3 (Annex – 7). The Railway Engineers raised two issues :-(a) Impact of the Project on Environment and (b) the cost sharing proposal for completion of the DPR. The CE/SD, Engineering Railways stated that they agree with the technical views in formation of the WSP but disagreed on the cost sharing issue.

It is pertinent to mention here that the advisory of the Ministry of Environment & Forest implements the National Lake Conservation Plan, a Centrally Sponsored Scheme, aiming at restoration of water quality and ecology of the lakes in the country, the Scheme is under implementation since 2001 having funding pattern of 70:30 between Central and State Government

iv. 'Santragachi Jheel' being a Railway property and as the Railway Engineers are not satisfied with the solution prepared by the KMDA Engineers on behalf of UD & MA Department, Govt. of West Bengal,



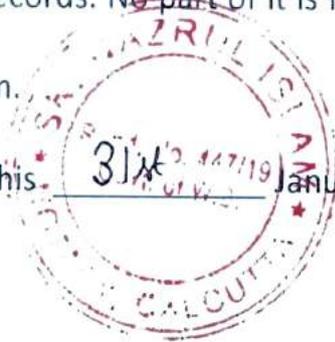
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it was recommended that Railway Authority should be given opportunity to come out with a better solution than what KMDA proposed. Report Of the Committee and the DPR are annexed herewith and marked as Annexure A/4.

### VERIFICATION

I, the deponent above named do hereby verify that the contents of the above affidavit are true and correct to the best of my knowledge which are derived from the relevant office records. No part of it is false and nothing material has been concealed there from.

Verified at Kolkata on this 31<sup>st</sup> January, 2022.



**DEPONENT**

Superintending Engineer (GAP),  
GAP-Wing, W & S-Sector, K.M.D.A.

The deponent is identified by me.

**Advocate**

Solely Affirmed and  
Declared before me U/S 139  
CPC, U/S 297 (C) CrPC

  
**Notary**

**SK Nazrul Islam**  
Notary, Govt. of W.B.  
Regd. No. 447/19  
City Civil Court Calcutta

**31 JAN 2022**

**Joint Finding Report of railway officials and KMDA along with consultant (EES) on  
09/10/2021.**

During meeting and field survey following points was found

1. The present sewage generation has measured (at outflow) in DPR is 1393 MLD has been verified
2. The main point of disagreement with the proportion of sewage generation between railways and HMC.
3. Computation of sewage generation has been done on the basis of existing drain flow measurement.
4. The record of quarter in DPR about the waste water discharge in SRC JHEEL is not correct 595 nos of Quarter were considered in DPR, but only 313 nos quarter (Out of which 225 nos of occupied quarters and 88 nos of quarter are vacant) are discharging waste water into SRC JHEEL. Rest quarters are discharging there waste water to MAUKHAAL.
5. Waste water discharge from Encroachments has also been considered in railway share
6. i) KMDA's view point is that Outfall no 5.1.5.2 and 5.3 are passing through railway property line that is why considered in railway portion in DPR.  
ii) As per railway opinion Outflow No 5.1.5.2 and 5.3 is mainly from nearby Bazaar area and encroachments, but considered in railway discharge which is incorrect, which is to be modified based actual nos of railway staffs residing in that area.
7. The water from railway station and coaching depot is not contributing any discharge to SRC JHEEL. Already ETP has been commissioned in SRC Coaching Depot. waste water is being recycled. This was also not considered in sewage generation for SRC JHEEL in DPR.
8. The Railway portion of discharge should be calculated based on actual nos of population contributing waste water discharge to SRC JHEEL. Because at many points of Measurements of outflow taken as railway outflow, water is coming from Encroachments and HMC area. Computation of sewage generation has been done on the basis of existing drain flow measurement in DPR.
9. Railway had provided septic tanks in all the quarters.
10. The Staff of railway is reducing Day By Day, by using modern technology as a result there will be no expansion of the existing settlement.
11. Moreover after removal of the encroachments waste water discharge will further reduce. As well as solid waste disposal and open defecation which is directly dumped in SRC JHEEL will be stopped and improve the condition of SRC JHEEL.

  
09/10/2021  
Niranjana Das  
Dy CE/SD & Works/GRC

  
09/10/21  
Anand Kumar  
Dy CENHM/GRC

  
Ravi Kumar Gupta  
Dy Engr/KGP

  
2.10.2021  
Abhijit Paul  
Project Manager/  
Environmental Engineering Services(EES)

  
09/10/21  
Madhusudan Biswas  
Executive Engineer/ KMDA



8/3

Office of the Chief Engineer  
GAP Wing, W&S Sector, KMDA,  
Unnayan Bhavan, D Block, 1<sup>st</sup> Floor,  
Salt Lake City, Kolkata 700 091.

Amesure - A 2

**Kolkata  
Metropolitan  
Development  
Authority**

No.: 278/CE/GAP/W&amp;S/KMDA/ NGI

Date: - 28/10/2021

From: **The Chief Engineer,**  
GAP wing, W&S Sector, KMDA  
D Block, 1<sup>st</sup> Floor, Unnayan Bhavan

To : **Divisional Railway Manager/Engg.**  
**South Eastern Railway, Kharagpur**

**Sub:** Response to the Observations made vide memo no.DENE/KGP/SRC JHEEL/DPR/23 dated- 20.10.2021 on the DPR for pollution abatement at Santragachj Jheel.

Sir,

With reference to the above our response is submitted (enclosed) against your observations submitted vide memo no. DENE/KGP/SRC JHEEL/DPR/23 dated- 20.10.2021 for your perusal and necessary action please.

Thanking You,

Yours faithfully,

Encl.: As stated

Chief Engineer  
GAP Wing/W&S Sector/KMDA.

No.: 178/1(8)/CE/GAP/W&amp;S/KMDA/NGT

Date: - 28/10/2021

Copy forwarded for information &amp; necessary action to:-

1. The Chief Executive Officer, KMDA.
2. The District Magistrate, Howrah.
3. The Commissioner, Howrah Municipal Corporation.
4. The Joint Secretary, UD & MA Department, Govt. of West Bengal.
5. The ADM, Land, Howrah.
6. The Superintending Engineer (GAP), W & S Sector, KMDA.
7. The Executive Engineer, EB-I, GAP Wing, W & S Sector, KMDA.
8. Office Copy.

Chief Engineer  
GAP Wing/W&S Sector/KMDA.

**Response to the Observations submitted on 20.10.2021 by the Divisional Railway Manager/Engg., South Eastern Railway, Kharagpur on the DPR and subsequent joint site inspection along with the Professor Amit Dutta, J.U. for pollution abatement at Santragachi Jheel.**

**A. Impact of the Project on Environment**

Railways Observations	KMDA's Response
<p>The proposed Waste Stabilization Pond (WSP) consist of 3 (Three) ponds, namely (i) Anaerobic Pond, (ii) Secondary Facultative Pond &amp; (iii) Maturation Pond. Depth of anaerobic pond is 3.5 m with volumetric surface <b>BOD loading 235 gm/m<sup>3</sup></b> and effluent BOD as 20.62 mg/l. On the other hand, depth of facultative pond is 2.0 m with influent BOD/effluent BOD as 20.62 mg/l / 13.98 mg/l and those of Maturation Pond are 1.5 m &amp; 13.98 mg/l / 9.79 mg/l. The Facultative Pond and Maturation Pond may generate very little or no odour, but the <b>anaerobic pond</b> by its nature and with <b>high influent BOD ranging to 235 mg/m<sup>3</sup></b> will be a <b>big source of foul and obnoxious odour</b> which may not be proper of the residents of the surrounding area as well as environment as a total. The method of converting anaerobic pond into a Facultative Pond to control the odour by increasing its depth as mentioned in Para 5.3 &amp; 5.8 of the DPR is not convincing. The aerobic and anaerobic process works simultaneously in a facultative pond in upper and bottom layer, respectively and not in anaerobic pond therefore, the facultative ponds with depth varying between 1.0 m to 1.5 m are thus most widely used for treatment of sewage.</p>	<p>(i) The average depth the portion of the existing pond which is considered for WSP is 3.5 to 4m. To minimize the pond area, construction cost and to match with the present depth of the pond the effective depth of first pond was considered as 3.5m and designed as a facultative pond. As the depth is 3.5 m this pond predominantly acts as a facultative pond with the anaerobic zone at the bottom. This type of modification has also recommended in the standard &amp; authentic reference books of WSP design. In the DPR, it was clearly mentioned in the page no: 37 (before the WSP design page) that the first pond will act as facultative pond in which the upper portion of the pond act as aerobic pond, middle portion act as a facultative (anoxic condition) pond and bottom portion act as anaerobic pond. However, as the influent BOD is less (50 mg/l i.e. 50 g/m<sup>3</sup>), so rate of dissolved oxygen (DO) depletion will be less and because of symbiotic relationship between algae and bacteria sufficient amount of DO will present in the upper layer. Therefore aerobic and facultative conditions will be predominant in the system. The sulphate amount present in influent is 14 mg/l only. This less amount of sulphate will produce almost negligible amount of odour causing H<sub>2</sub>S. This H<sub>2</sub>S will also converted into dissolved HS<sup>-</sup> ion in anaerobic zone. So, considering the amount of BOD load and sulphate loss this pond will not going to generate any significant amount of odour at all.</p> <p>The <b>unit</b> for the volumetric surface loading was mistakenly written as 235 gm/m<sup>3</sup> day instead of 235 kg/ha day and this is the allowable permissible loading limit only, not the actual loading. The Actual BOD loading rate in the first pond is 50 mg/l or 50 g/m<sup>3</sup>.</p>

  
 Executive Engineer  
 EB-1/GAP/W&B Sector,  
 KMDA

  
 Chief Engineer,  
 Water & Sanitation (GAP) Sector, KMDA

<p>ii. As per Layout Plan (Drg No 11) of the Project scheme, construction of the Maturation Pond and Anerobic Pond has been planned on either side of the Railway quarters and Facultative Pond is after the Maturation Pond <b>which is not proper. However,</b> if WSP only is to be adopted as treatment process then the <b>Anaerobic Pond should be constructed far away</b> from Railway quarters.</p>	<p>(ii) As explained earlier, the first pond is actually Primary Facultative Pond on which no significant amount of odour is going to generate, following that the secondary facultative pond and then the Maturation Pond. Maturation pond is located along the north and east corner of railway quarter. The maturation pond has the purest waste water quality among these three ponds. So this is the best option to construct the maturation pond on that corner. The predominant wind direction is from South-West direction in summer and in winter it is from North-West direction. Keeping these things in view, the ponds are located in such a way that it is going to least affect to the railway quarter.</p>
<p>iii. By constructing WSP in the smaller Pond, SantragachiJheel may become pollution free, but the smaller pond will remain somehow polluted forever due to the treatment process. However, it will be better to keep both water bodies pollution free.</p>	<p>(iii) Garland drain has been suggested surrounding of both the SantragachiJheel and the smaller pond to catch the drainage outfalls which are polluting the water bodies. Some portion of the smaller pond which is already polluted by the discharge of existing outfalls will be converted into Waste Stabilization Pond (WSP) for treatment purposes. So, this will ultimately improve water quality substantially and it also improves the biodiversity of Santragachi jheel and as well as the smaller pond. In this project, some portion of small pond is used to converting it to another pond (WSP) therefore it has least effect on environment &amp; bio-diversity of surroundings.</p>

B. Cost Sharing by Railway:

<p>1. Cost share of the project to be borne by Railway has been fixed as 18% (Eighteen Percent) by Hon'ble NGT/Kolkata in its order dated 15.09.2017 based on the population contributing into waste generation. Population of Railway is more or less on declining side and therefore, Railway's contribution and thus the share of 18% should decrease further. Hence, Railway's share more than 18% is not acceptable. It is also worth to mention that Railway has made provision for constructing Bio-digestors for station premises which is likely to be completed in a year or two. Further, it is planning to construct Bio-digestors for colonies, barracks etc. also and after providing the same Railway's contribution may become Nil in the coming years.</p>	<p>NGT issued Order on date of hearing 30.09.2020 where it is stated that- 3. (i) the Railway would provide for the land for setting up STP for treatment of sewerage diverted away from the 'Jheel'; (ii) the cost of the project would be shared between the Howrah Municipal Corporation and the Railways in the ratio of the contribution of sewage (Annexure-A). The station premises sewerage were not discharged into the Jheel and also has not been considered into this STP project so the matter has no relation with this DPR.</p>
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Executive Engineer  
EB-1/GAP/W&B Sector,  
K.M.D.A.

Chief Engineer,  
Water & Sanitation (GAP) Sector, K.M.D.A.

<p>ii. Para 4.5.3 &amp; 4.5.4 of the DPR along with related Tables deals with the calculation of discharge on the basis of population and outfall survey and as per norms larger one has to be taken as design discharge. Further, in the last part of Para 4.5.4, it has been clearly stated that the outfall discharge may be more than that based on population basis because of accumulation of more waste water from adjacent wards. Therefore, contribution of Railway should be strictly adhered on population basis only and should not exceed 18%. Also, the findings of Joint Inspection done on 09.10.2021 as Santragachi by State Authorities and Railways should be adhered in totality.</p>	<p>ii. As per the CPHEEO manual, the discharge of outfall has been calculated on the basis of population and also actual discharge of each outfall (both in HMC portion and railway portion). As per the manual guideline, higher value between both need to be considered. It was observed that actual discharge measure at each 55 nos of outfall comes higher, therefore the same has been considered. Each 55 Nos of outfall discharge from HMC and railway portion were measured and the same is mentioned in Table 4.9 (Page -19) in the DPR, from which it becomes clear that how much amount of wastewater is coming from HMC and Railway portion and fund contribution is suggested based on that only. As per recommendation of the committee, the discharge of all outfalls has also been verified during the 'Joint inspection held on 9<sup>th</sup> October 2021 and the same is confirmed in the join inspection report (Annexure-B).</p>
<p>iii. Para 5.3 of the DPR mentions that source of pollutions forms the illegal encroachments are not considered in the extant DPR to mitigate in view that the same will be evicted by administration whereas item No. 5 of findings of the Joint Inspection dated 09.10.2021 mentions that waste water generation form encroachments has also been considered in Railway's share. It should be checked, clarified and discharge be rectified as require. Moreover, to make the WSP built as per the extant DPR, eviction of encroachments is the very first necessity.</p>	<p>iii. The sources of pollutions of Jheel area has been identified and mentioned in the DPR. Provision of waste bins are provided in the DPR to stop the bad practice of open dumping by locals. Interception &amp; Diversion approach has been taken to catch the outfalls and directed to STP for treatment purpose. Community toilets are also prescribed at the surrounding area of Jheel. The steps of social awareness process regarding the environmental and social impact of pollution has also mentioned in the DPR to encourage the locals for keeping the Jheel clean &amp; pollution free. Respective cost of the same has estimated in the same DPR. However removal of encroachment is an administrative issue.</p>
<p>iv. Para 5.0 of the DPR mentions about construction of Public toilets in Railway area and Para 5.4 mentions about placement of waste bins at regular intervals. Use of Railway land for the same is not acceptable.</p>	<p>No comments.</p>
<p>v. In various Paras of DPR it has be mentioned that it has be requested by UD&amp;MA, GoWB to the Railways to provide Railway land required for the</p>	<p>NGT issued Order on date of hearing 30.09.2020 wherein it is stated that-</p>

Executive Engineer  
EB-1/GAP/W&B Sector,  
K.M.D.A.

Chief Engineer,  
Water & Sanitation (GAP) Sector, KMDA.

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<p>project free of cost which is not possible as permission for use of Railway Land for Railway's core activities and other related purposes which also includes development of public utilities by Government and other bodies is governed by Ministry of Railways' letter No. 2011/LML/18/17 dated 24/01/2012 and it has been <b>approved by Cabinet.</b></p>	<p>3. (i) the Railway would provide for the land for setting up STP for treatment of sewerage diverted away from the 'Jheel' (Annexure-A).</p>
<p>vi. In Para 5.9.1 of the DPR, it has been mentioned that the smaller pond (65000 Sqm) will be divided into 3 (Three) Parts for construct of 3 Ponds and thus it seems that total 65000 Sqm area of Pond will be utilized for construction of WSP. On the other hand in the same Para it is said that for construction of the embankments pond area will be reduced to 43000 Sqm which means that only 22000 Sqm will be utilized for SWP. Clarification of actual total land area require for construction of WSP, garland drains Pump houses etc. is necessary to assess the way leave and land lease charges which may range <b>from Rs 24.0 crore to Rs. 64.0 Crore for land are 22000 Sqm to 65 Sqm.</b></p>	<p>Only portion of the small pond has considered for constructing the Waste stabilization pond. The total area of Embankment top required for construction of WSP is 1276 Sqm. (perimeterx2mtr.) which shall be converted into solid land. Hence 1276 sqm. area will be reduced. 22000 sqm. area to be utilised in the WSP as shown in the DPR is the base area of the embankment but this area will remain under water. The area required for construction of new garland drain is 3308 Sqm for the total length of 3km.</p>
<p>vii. The Project cost of WSP is Rs. 28.82 Crore (Approx.) inclusive of O&amp;M cost for 15 years (Rs. 12.07 Crore) and exclusive of land charges which is itself much more than the cost of STP as per earlier DPR. Which was Rs. 20.0 Crore inclusive of land charges. On the other hand, the Project cost of WSP work out to be Rs. 53 Crore to 93.0 Crore inclusive of land charges as per land required. This cost will be enormous.</p>	<p>As per guide line the land cost has not been considered in the cost estimate as Railway being the Owner of the Santragachi jheel. The process design mentioned in previous DPR is not clear, also it does not follows any of the recommended process mentioned in the CPHEEO manual (Guideline by Govt. Of India) that is why KMDA has been engaged to find out alternative solutions.</p>

*[Signature]*  
Executive Engineer  
EB-1/GAP/W&B Sector,  
K.M.D.A.

*[Signature]*  
Chief Engineer  
Water & Sanitation (GAP) Sector, KMDA.



GOVERNMENT OF WEST BENGAL  
Office of the District Magistrate, Howrah

Joint inspection of Santragachi Jheel by the committee formed as per the decision of the meeting held on 07.10.2021 at the chamber of the District Magistrate, Howrah in connection with compliance to the order of the Hon'ble N.G.T. in O.A. 06/2016/EZ.

Venue: Assistant Divisional Engineer, SER, Santragachi.

Date: **22.10.2021, Time: 11.00 A.M.**

Persons attended: List enclosed.

As per the decision of the meeting held on 07.10.21 at the chamber of the DM, Howrah the Railway authorities complete the task of scrutinizing the DPR issues by 20.10.2021, and a committee was formed for a joint sitting/inspection along with Prof. Amit Datta, JU on 22.10.2021 at 11 a.m. at the office of the Asst. Divisional Engineer, South Eastern Railway. Accordingly the committee member along with Prof. Amit Datta, JU met at the chamber of the Asst. Divisional Engineer, South Eastern Railway and started discussion.

The Railway authority stated that they scrutinise the DPR of WSP and its impact on environment and raised issues A. on impact of the Project on environment and B. Cost sharing by Railway. The Divisional Railway Manager/Engg, SER, Kharagpur vide letter No DENE/KGP/SRC JHEEL/DPR/23 dated 20.10.2021 dated already shared their observations with the UDMA deptt and KMDA and want response from the KMDA on the raised issues.

The point wise raised issues were discussed and responded by the EE, KMDA and Pro. Amit Datta, JU.

**A. Impact of the Project on Environment:**

Railways Observation	KMDA's Response
<p>1) The proposed Waste Stabilization Pone (WSP) consist of 3(three) ponds, namely (i) Anaerobic Pond; (ii) Secondary Facultative Pond &amp; (iii) Maturation Pond. Depth of Anaerobic pond is 3.5 m with volumetric surface <b>Bod loading 235 gm/m<sup>3</sup></b> and effluent BOD as 20.62 mg/l. On the other hand, depth of facultative pond is 2.0 m with influent BOD/effluent BOD as 20.62 mg/l 13.98 mg/l and those of Maturation Pond are 1.5 m &amp; 13.98 mg/l/9.79 mg/l. the Facultative Pond and Maturation Pond may generate very little or no odour, but the <b>anaerobic pond</b> by its nature and</p>	<p>i) The average depth the portion of the existing pond which is considered for WSP is 3.5 to 4 m. to minimize the pond area, construction cost and to match with the present depth of the pond the effective depth of first pond was considered as 3.5 m and designed as a facultative pond. <b>As the depth is 3.5 m this pond predominantly acts as a facultative pond with the anaerobic zone at the bottom.</b> This type of modification has also recommended in the standard &amp; authentic reference books of WSP design. In the DPR, it was clearly mentioned in the page no: 37(before the WSP design page) that the first pond</p>

<p>with high effluent BOD ranging to 235 mg/m<sup>3</sup> will be a big source of foul and obnoxious odour which may not be proper of the residents of the surrounding area as well as environment as a total. The method of converting anaerobic pond into a Facultative Pond to control the odour by increasing its depth as mentioned in Para 5.3 &amp; 5.8 of the DPR is not convincing. The aerobic and anaerobic process works simultaneously in a facultative pond in upper and bottom layer, respectively and not in anaerobic pond therefore, the facultative ponds with depth varying between 1.0 m to 1.5 m are thus most widely used for treatment of sewage.</p>	<p>It will act as facultative pond in which the upper portion of the pond act as aerobic pond, middle portion act as a facultative (anoxic condition) pond and bottom portion act as anaerobic pond. However, as the influent BOD is less (50 mg/l i.e. 50 g/m<sup>3</sup>), so rate of dissolved oxygen (DO) depletion will be less and because of symbiotic relationship between algae and bacteria sufficient amount of DO will present in the upper layer. Therefore, aerobic and facultative conditions will be predominant in the system. The sulphate amount present in influent is 14 mg/l only. This less amount of sulphate will produce almost negligible amount of odour causing H<sub>2</sub>S. This H<sub>2</sub>S will also be converted into dissolved HS ion in anaerobic zone. So, considering the amount of BOD load and sulphate load this pond will not go to generate any significant amount of odour at all.</p> <p>The unit for the volumetric surface loading was mistakenly written as 235 gm/m<sup>3</sup> day instead of 235 kg/ha day and this is the allowable permissible loading limit only, not the actual loading. The Actual BOD loading rate in the first pond is 50 mg/l or 50g/m<sup>3</sup>.</p>
<p>ii) As per Layout Plan (Drg No. 11) of the Project scheme, construction of the Maturation Pond and Anaerobic Pond has been planned on either side of the Railway quarters and Facultative Pond is after the Maturation Pond which is not proper. However, if WSP only is to be adopted as treatment process then the Anaerobic Pond should be constructed far away from Railway quarters.</p>	<p>ii) As explained earlier, the first pond is actually Primary Facultative Pond on which no significant amount of odour is going to generate, following that the secondary facultative pond and then the Maturation Pond. Maturation pond is located along the north and east corner of railway quarter. The maturation pond has the purest waste water quality among these three ponds. So this is the best option to construct the maturation pond on that corner. The predominant wind direction is from North -West direction. Keeping these things in view, the ponds are located in such a way that it is going to least affect to the railway quarter.</p>
<p>iii) By constructing WSP in the smaller Pond, Santragachi Jheel may become pollution free, but the smaller pond will remain somehow polluted forever due to the treatment process. However, it will be better to keep both water bodies pollution free.</p>	<p>iii) Garland drain has been suggested surrounding of both the Santragachi Jheel and the smaller pond to catch the drainage outfalls which are polluting the water bodies. Some portion of the smaller pond which is already polluted by the discharge of existing outfalls will be converted into Waste Stabilization Pond (WSP) for treatment purposes. So, this will ultimately improve water quality substantially and it also improves the biodiversity of Santragachi Jheel and as well as the smaller pond. In this project, some portion of small pond is used to converting it to another pond (WSP) therefore it has least effect on environment &amp; bio-diversity of surroundings.</p>

## B. Cost Sharing by Railway.

Railways Observation	KMDA's Response
<p>i) Cost share of the project to be borne by Railway has been fixed as 18% (Eighteen Percent) by Hon'ble NGT/Kolkata in its order dated 15.09.2017 based on the population contributing into waste generation. Population of Railway is more or less on declining side and therefore, Railway's contribution and thus the share of 18% should decrease further. Hence Railway's share more than 18% is not acceptable. It is also worth to mention that Railway has made provision for constructing Bio-digestors for station premises which is likely to be completed in a year or two. Further, it is planning to construct Bio-digestors for colonies, barracks etc also and after providing the same Railway's contribution may become Nil in the coming years.</p>	<p>i) NGT issued Order on date of hearing 30.09.2020 where it is stated that 3. (i) the Railway would provide for the land for setting up STP for treatment of sewerage diverted away from the 'Jheel'; (ii) the cost of the project would be shared between the Howrah Municipal Corporation and the Railways in the ratio of the contribution of sewage (Annexure - A). The station premises sewage were not discharged into the Jheel and also has not been considered into this STP project so the matter has no relation with the DPR.</p>
<p>ii) Para 4.5.3 &amp; 4.5.4 of the DPR along with related Tables deals with the calculation of discharge on the basis of population and outfall survey and as per norms larger one has to be taken as design discharge. Further, in the last part of Para 4.5.4, it has been clearly stated that the outfall discharge may be more than that based on population basis because of accumulation of more waste water from adjacent wards. Therefore, contribution of Railway should be strictly adhered on population basis only and should not exceed 18%. Also, the findings of Joint Inspection done on 09.10.2021 as Santragachi by State Authorities and Railways should be adhered in totality.</p>	<p>ii) As per the CPHEEO manual, the discharge of outfall has been calculated on the basis of population and also actual discharge of each outfall (both in HMC portion and railway portion). As per the manual guideline, higher value between both need to be considered. It was observed that actual discharge measure at each 55 nos of outfall comes higher, therefore the same has been considered. Each 55 nos of outfall discharge from HMC and railway portion were measured and the same is mentioned in Table 4.9 (Page - 19) in the DPR, from which it becomes clear that how much amount of wastewater is coming from HMC and Railway portion and fund contribution is suggested based on that only. As per recommendation of the committee, the discharge of all outfalls has also been verified during the 'Joint Inspection held on 9<sup>th</sup> October, 2021 and the same is confirmed in the joint inspection report (Annexure - B).</p>
<p>iii) Para 5.3 of the DPR mentions that source of pollutions forms the illegal encroachments are not considered in the extant DPR to mitigate in view that the same will be evicted by administration whereas item No. 5 of findings of the Joint Inspection dated 09.10.2021 mentions that waste water generation form encroachments has also been considered in Railway's share. It should be checked, clarified and discharge be rectified as require. Moreover, to make the WSP built as per the extant DPR, eviction of encroachments is the very first necessity</p>	<p>iii) The sources of pollutions of Jheel area has been identified and mentioned in the DPR. Provision of waste bins are provided in the DPR to stop the bad practice of open dumping by locals. Interception &amp; Diversion approach has been taken to catch the outfalls and directed to STP for treatment purpose. Community toilets are also prescribed at the surrounding area of Jheel. The steps of social awareness process regarding the environmental and social impact of pollution has also mentioned in the DPR to encourage the locals for keeping the Jheel clean &amp; pollution free. Respective cost of the same has estimate in the same DPR. However removal of encroachment is an administrative issue.</p>

iv) Para 5.0 of the DPR mentions about construction of Public toilets in Railway area and Para 5.4 mentions about placement of waste bins at regular intervals. Use of Railway land for the same is not acceptable.	iv) No comments.
v) In various Paras of DPR it has to be mentioned that it has been requested by UD&MA, GoWB to the Railways to provide Railway land required for the project free of cost which is not possible as permission for use of Railway Land for Railway's core activities and other related purposes which also includes development of public utilities by Government and other bodies is governed by Ministry of Railways' letter No. 2011/LML/18/17 dated 24/01/2012 and it has been <b>approved by Cabinet.</b>	v) NGT issued Order on date of hearing 30.09.2020 wherein it is stated that - 3. (i) the Railway would provide for the land for setting up STP for treatment of sewerage diverted away from the 'Jheel'(Annexure - A).
vi) In para 5.9.1 of the DPR, it has been mentioned that the smaller pond (65000 Sqm) will be divided into 3 (three) Parts of r construct of 3 Ponds and thus it seems that total 65000 Sqm area of Pond will be utilized for construction of WSP. On the other hand in the same Para it is said that for construction of the embankments pond area will be reduced to 43000 Sqm which means that only 22000 Sqm will be utilized for SWP. Clarification of actual total land area require for construction of WSP, garland drains Pump houses etc. it necessary to assess the way leave and land lease charges which may range <b>from Rs. 24.0 Crore to Rs. 64.0 Crore for land are 22000 Sqm to 65 Sqm.</b>	vi) Only portion of the small pond has considered for constructing the Waste Stabilization Pond. The total area of Embankment top required for construction of WSP is 1276 Sqm. (perimeter x 2 mtr.) which shall be converted into solid land. Hence 1276 sqm. Area will be reduced. 22000 sqm. Area to be utilized in the WSP as shown in the DPR is the base area of the embankment but this area will remain under water. The area required for construction of new garland drain is 3308 Sqm for the total length of 3 km.
vii) The Project cost of WSP is Rs. 28.82 Crore(Approx.) inclusive of O&M cost for 15 years (Rs. 12.07 Crore) and exclusive of land charges which is itself much more than the cost of STP as per earlier DPR which was Rs. 20.0 Crore inclusive of land charges. On the other hand, the Project cost of WSP work out to be Rs. 53 Crore to 93.0 Crore inclusive of land charges as per land required. This cost will be enormous.	vii) As per guideline the land cost has not been considered in the cost estimate as Railway being the Owner of the Santragachi Jheel. The process design mentioned in previous DPR is not clear, also it does not follows any of the recommended process mentioned in the CPHEEO manual (Guideline by Govt. of India) that is why KMDA has been engaged to find out alternative solutions.

The EE, KMDA stated that he has no authority to come to decision on the cost sharing issue in the joint inspection and it will be decided by the UDMA department itself.

The railway authority wanted the written response from the KMDA on their written observation sent on 20.10.2021.

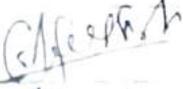
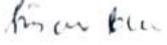
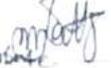
Then it was decided that the KMDA authority will provide point wise their written explanation or response within a very short period for Railways consideration so that the stalemate can be resolved as early as possible.

District Magistrate

*Sudip Howrah*  
27/10/21

Attendance of joint joint inspection Santragachi Jheel as per the decision of the meeting held on 07.10.2021 at the chamber of District Magistrate, Howrah.

Date 22 10 21 Time 11 00 AM

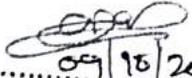
Sl No	Name and Designation	Deptt	Signature	Contact No
	RAVI KUMAR GAUTAM	RAILWAY		9002081202
	B. B. SAHOO	Railway		9002081219
	R. SEN	Railway		9002081226
	Madhusudan Biswas	KMDA		8240739691
2	P. K. Bhattacharya	HAAC	P. K. Bhattacharya	9850168182
	Ajeed Kumar Singh General manager	Consolidation		9830068733
	Sujan Khan	EES		6295316032
	Abdijit Paul	EES consultant		9038992028
	Amit Dutta	EES		9051511555
	Indranil Bhattacharyya SDO in charge	Office of the District Magistrate		8335042101
	Prasanta Kr. Maity, DDO	Office of Dist. Howrah		8336916366
	Suman Pal, SDO	LSLR		8336916367

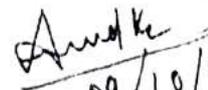
Joint Finding Report of railway officials and KMDA along with consultant (EES) on

09/10/2021

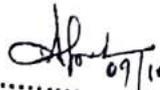
Discrepancies and findings of the joint report are found

1. The present sewage generation has measured (at outflow) in DPR as 1.03 MLD has been verified.
2. The main point of disagreement with the proportion of sewage generation between railways and HMC.
3. Computation of sewage generation has been done on the basis of existing drain flow measurement.
4. The record of quarter in DPR about the waste water discharge in SRC JHEEL is not correct. 595 nos of Quarter were considered in DPR, but only 313 nos quarter (Out of which 225 nos of occupied quarters and 88 nos of quarter are vacant) are discharging waste water into SRC JHEEL. Rest quarters are discharging their waste water to MAUKHAM.
5. Waste water discharge from Encroachments has also been considered in railway share.
6. i) KMDA's view point is that Outfall no 5.1, 5.2 and 5.3 are passing through railway property line that is why considered in railway portion in DPR.  
ii) As per railway opinion Outflow No 5.1, 5.2 and 5.3 is mainly from nearby Bazaar area and encroachments, but considered in railway discharge which is incorrect, which is to be modified based actual nos of railway staffs residing in that area.
7. The water from railway station and coaching depot is not contributing any discharge to SRC JHEEL. Already ETP has been commissioned in SRC Coaching Depot, waste water is being recycled. This was also not considered in sewage generation for SRC JHEEL in DPR.
8. The Railway portion of discharge should be calculated based on actual nos of population contributing waste water discharge to SRC JHEEL. Because at many points of Measurements of outflow taken as railway outflow water is coming from Encroachments and HMC area. Computation of sewage generation has been done on the basis of existing drain flow measurement in DPR.
9. Railway had provided septic tanks in all the quarters.
10. The Staff of railway is reducing Day By Day by using modern technology as a result there will be no expansion of the existing settlement.
11. Moreover after removal of the encroachments waste water discharge will further reduce. As well as solid waste disposal and open defecation which is directly dumped in SRC JHEEL will be stopped and improve the condition of SRC JHEEL.

  
09/10/2021  
.....  
Niranjana Das  
Dy CEnHM/GRC

  
09/10/21  
.....  
Anand Kumar  
Dy. CE /SD & Works/GRC

  
.....  
Ravi Kumar Gupta  
DEN/East/KGP

  
09/10/2021  
.....  
Abhijit Paul  
Project Manager/  
Environmental Engineering Services(EES)

  
09/10/21  
.....  
Madhusudan Biswas  
Executive Engineer/ KMDA

824



GOVERNMENT OF WEST BENGAL  
Office of the District Magistrate, Howrah

**Resolution of meeting in connection with compliance to the order of the Hon'ble N.G.T. in O.A. 06/2016/EZ.**

Venue: Conference Hall, 3<sup>rd</sup> floor, New Collectorate Building, Office of the District Magistrate, Howrah.

Date: 07.10.2021, Time: 12.30 p.m.

Persons attended: List enclosed.

Present: District Magistrate, Howrah, Commissioner, HMC, Chief Mechanical Engineer (Environment), Railway, Chief Engineer, KMDA.

The District Magistrate presided over the meeting and initiated the discussion.

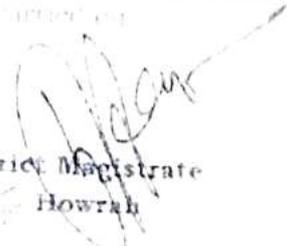
1. The District Magistrate requested the Commissioner, HMC to briefly describe the issues regarding the Santragachi Jheel.
2. The Commissioner, HMC stated that the Hon'ble N.G.T. has already mandated to maintain the biodiversity of Santragachi Jheel and for this an expert agency was brought by KMDA, UD & MA to assess the situation and it came up with an alternate solution of forming a WSP (Waste Stabilization Pond) for decanting the waste water through a gulland drain after series of long discussion with all stakeholders.
3. It is also stated that the Railway authorities has prayed for time before the Hon'ble N.G.T. to scrutinize the environmental impact of the project and the cost sharing of the project. It is also stated that the Railway authorities are themselves. That previously the cost share was 50% and the percentage of discharge of the waste water by the park is, now other studies were ascertained.
4. That the Chief Mechanical Engineer (Environment) from the Railways, informed that the Railway authorities have been running its own STP since 10.09.2021 in the railway coach depot for washing the coaches and other station building water at station. It is also stated that the Railway authorities have the STP and the water is being discharged into the Jheel. It is also stated that the Railway authorities are therefore reducing the flow of discharge into the Jheel.
5. The Chief Engineer, KMDA, informed that the flow of discharge was already measured and obtained earlier, but it needs to be re-assessed. That a proposal for joint inspection of the Jheel was already made and the same is under process.

inspected and the same is under process.

- 1) Sri P. M. Biswas, Executive Engineer, KMDA
- 2) Sri B. K. Chaitan, J. O. N. (East) (In-charge)
- 3) Sri A. and K. Mahapatra, J. O. N. (East) (In-charge)
- 4) Sri P. K. Dhanu, Executive Engineer, HMC
- 5) Ajay Singh, Consultant, EES
- 6) Abhishek Paul, Consultant, EES
- 7) Sri. Sanjiv Bhattacharya, S. O. S. (In-charge), Howrah
- 8) Sri. Ananta K. Mahapatra, J. O. N. (East) (In-charge)

The Chief Engineer, KMDA has presented some points regarding the WSP stating that it is not the proper method as it is not sustainable as require much larger place and would also emit foul odour due to the aerobic process of decomposition. He also raised the issue of lease charges in regard to the land to be used in this project, which is subsequently disagreed by the Chief Mechanical Engineer (Environment) from the Railways.

8. Mr. Anil Datta, Professor, stated that after detailed study and quantifying the discharge even for the future, WSP is a better alternative. He further states that 1.5 MLD has been considered, the potential wastewater generation. The evaluation of the encroachers being difficult and sensitive issue, formation of garland drain around all sides of the jheel would minimise the pollution of the jheel. That the WSP would least affects the biodiversity as a pond is remaining a pond and no further conversion of land to pond is required. Also the discharge would be in the form of depth of the pond is 10-15 feet. The cost of the project will be low as the amount of odour is going to be released. In this regard, the cost of the project will be low and maintenance of such ponds is less. That provision will be made for discharging the treated effluent in the gauge stand.
9. The Commissioner, BMC further stated that at the previous events, all the planning and costs incurred were done and borne by HMC and UD&MA, now finally suggestions and actions are needed to be done by the Railway authorities.
10. The District Magistrate reiterates that considering all the issues involved it is evident that for relocating the encroachers land is required to be provided by the Railway authorities and cannot do their responsibilities as they only allowed such 'Tahbazari' and took revenue from those people. The Railway authorities were asked to suggest a timeline to analyse and scrutinize the DPR.
11. The Railway authorities presently assist some 1000 to 1500 people on the 1.5 MLD. On 20.10.2021, they would complete the DPR and submit the DPR of the WSP proposal and requested for a joint inspection on 20.10.2021 at 11 AM at the office of the Asst. Divisional Engineer, Howrah (P&B).
12. It was also decided that on 09.10.2021 and 10.10.2021 at 11 AM, a joint inspection to check the discharge emission in the jheel will be carried out. The District Magistrate ended the meeting at 12.30 PM.

  
District Magistrate  
Howrah

Attendance sheet of meeting on 07/10/2021 regarding Santragachi Wheel for Compliance of the direction vide order dated 30.09.2021 of Hon'ble NGT passed in connection with O.A. No. 06/2016/EZ in the matter of Subhas Datta vs The State of West Bengal &ors.

SL.	Name	Designation	Department	Signature	Phone no.
1	Smt. Mukta Arya, IAS	District Magistrate, Howrah			
2	Chawal Jain	Commissioner H.M.C.	KMDA		9836401401
3	Prantik Ray	Chief Engineer	KMDA		9051511558
4	Amrit Dutta	Professor			9002080410
5	Saibal Bose	Chief Mech Engr (Em)			7830068733
6	Ajeet Singh	Consultant FES			9038792098
7	Abhijit Paul	FES	Consultant FES		9830797474
8	NUPUR SENHUPTA	AEF, WBPCB	WBPCB		8210734677
9	P.M. Biswas Prantik Ray	EE, KMDA	KMDA		7778189608
10	Indu Biswas	Law Officer	ADMR District, Howrah		6289500207
11	Ravi Gupta	CE/Assistant	Howrah		9002081202
12	RAVI KUMAR GAUTAM	DEN/CAST/KLP	Railway		9002080415
13	Anand Kumar	Dy CENM/ SER	Railway		8927448488
14	Soukanta Ghosh	ADFO Howrah	Forest		9073343224
15	Abhishek Sinha	Santragachi	Police		9830571856
16	Pratiksha Jha	DCP Santra	Police		8336916366
17	Tarun Bhattacharya	SDO (Sadar) Howrah	DM office		
18	Prasanta K. Maity	Dy. DLDO	DM office		
19					
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**GOVERNMENT OF WEST BENGAL**  
Office of the District Magistrate, Howrah

**Resolution of meeting in connection with compliance to the order of the Hon'ble N.G.T. in O.A. 06/2016/EZ.**

Venue: Conference Hall, 3<sup>rd</sup> floor, New Collectorate Building, Office of the District Magistrate, Howrah.

Date: 24.11.2021, Time: 12:30 p.m.

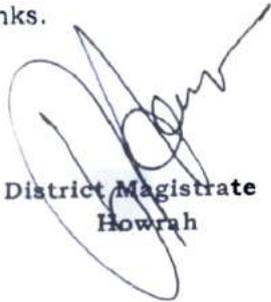
Persons attended: List enclosed.

The District Magistrate and District Collector, Howrah, presided over the meeting and initiated the discussion.

1. That as per the resolution taken in the meeting dated 07.10.2021; a joint inspection was held on 09.10.2021 and subsequently another meeting was held on 22.10.2021, wherein the officials from the Railways, KMDA, Department of Environment, Howrah Municipal Corporation, Mr. Amit Dutta, Professor, J.U., and other officials such as SDO, Sadar, Howrah, A.D.M.(LR), Howrah visited the Santragachi Jheel site. That during such meeting and survey, several points were raised by the Railways which were subsequently responded by the KMDA.
2. The District Magistrate reiterated the issues involved and requested the Railways to present their views on the point-wise response of the KMDA in regard to the observation submitted by the Railways for pollution abatement at Santragachi Jheel.
3. That initially, the DPR as submitted by KMDA was agreed upon by the Railways but again the Railways sent some remarks on the DPR submitted by KMDA. In response to such remarks, KMDA responded to the issues raised being-
  - A. Impact of the project on Environment.
  - B. Cost sharing by Railway. (Copy enclosed).
4. That again, a thorough discussion was held on each point raised by the Railways and the corresponding reply made by the KMDA in regard to the Santragachi Jheel in presence of the Railways, Department of Environment, Commissioner, Howrah Municipal Corporation and other officials present.
5. The Railway authorities present mainly emphasized on the removal of encroachment. That the issue of the eviction of the encroachers had already been discussed earlier, that the policy of the State Government is pellucid that the Railway would allot a land for the rehabilitation of the residents of the encroached area under the State Government housing scheme. The issue of lease charges in regard to the land to be used in this project was again raised, which was earlier disagreed by the Chief Mechanical Engineer (Environment) from the Railways.

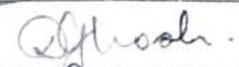
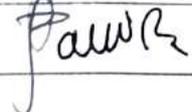
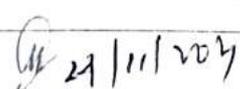
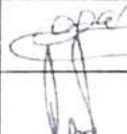
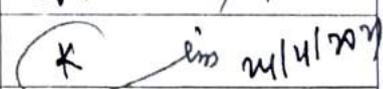
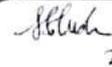
6. The CE/SD, Engineering Railway stated that they agree with the technical views in the formation of the WSP.

The District Magistrate ended the meeting with vote of thanks.



District Magistrate  
Howrah

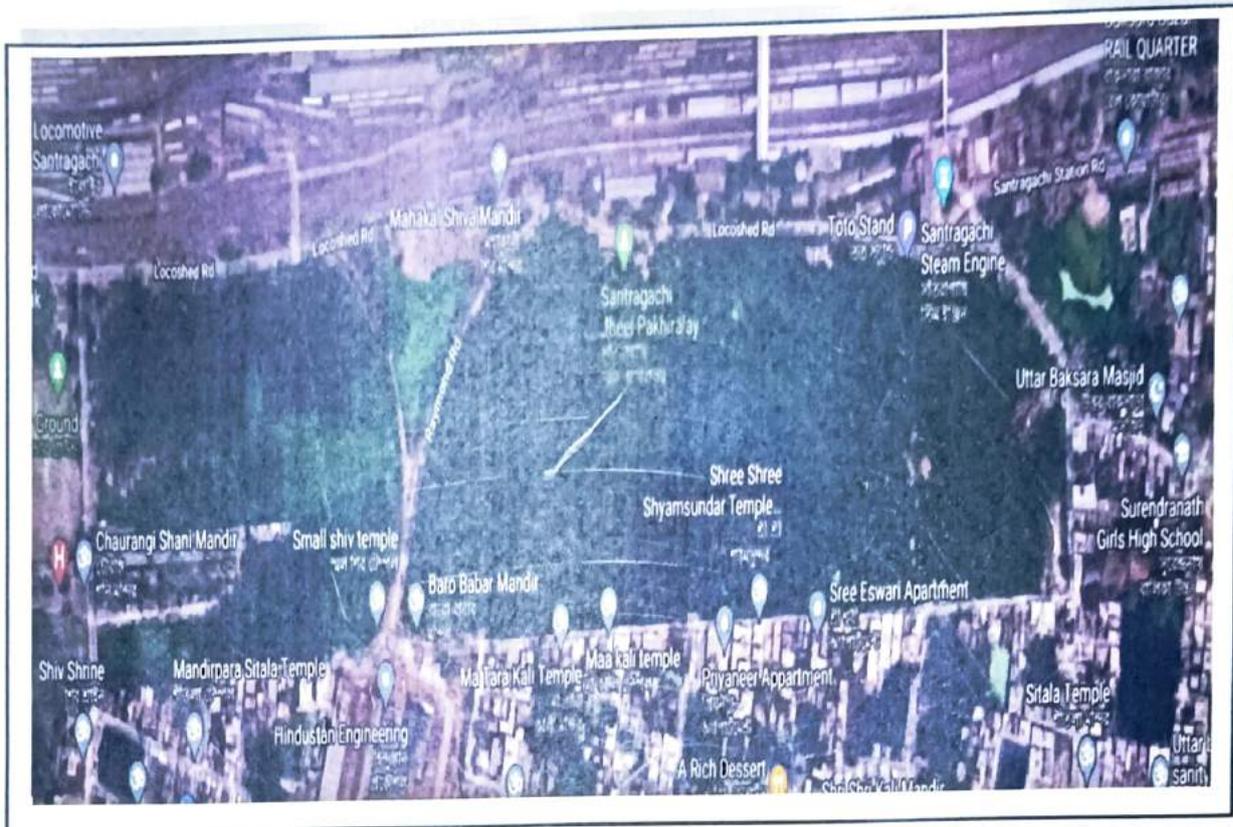
Meeting i.c.w. Santragachi Jheel on 24.11.2021 at 12.30 PM at DM's  
Conference Hall, 3rd floor, New Collectorate Building.

I No	Name and Designation	Deptt	Contact No	Signature
1.	Smt. Mukta Arya, IAS, DM, Howrah.			
2.	Shama Parmeen IAS	J.S. L&CR	8826108284	
3.	Debarati Ghosh.	ADM (LR)		
4.	Rhaval Talh	Commissioner	9619922660	
5.				
6.	A. Sarkar, Jt. Secy. Environmtl	Environment	9475462269	
8.	C.S. Pandey, CE/SD	Engineering PLY	9002080203	C.S. Pandey 24.11.2021
9.	NIRANJAN DAS	Engg.	9002080208	
10.	RAVI KUMAR GAUTAM	RAILWAY	9002081202	
11.	ANAND KUMAR	RAILWAY	9002080415	Anand K 24/11/2021
12.	ROUSHIK CHAKRABARTY	PLSERO SRO	8936916314	
13.	SRIKANTA GHOSH, ADFO	Forest	8927448488	
14.	LINA BISWAS	Law officer DLERO, Howrah	7998189608	
15.	Madhusadan Paisray	FF (WAP/KAIDA)	8240739631	
16.	Tareu Bhattacharyya	SDO (S), Howrah	9830571856	



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**Detailed Project Report for pollution abatement at Santragachi Jheel  
including Interception & Diversion (I&D) network, Pumping Station &  
Sewage Treatment Plant**



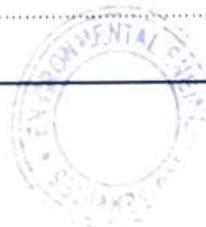
Prepared By:

**Environmental Engineering Services**

*Sanjay Das Mahapatra*

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#### ANNEXURE

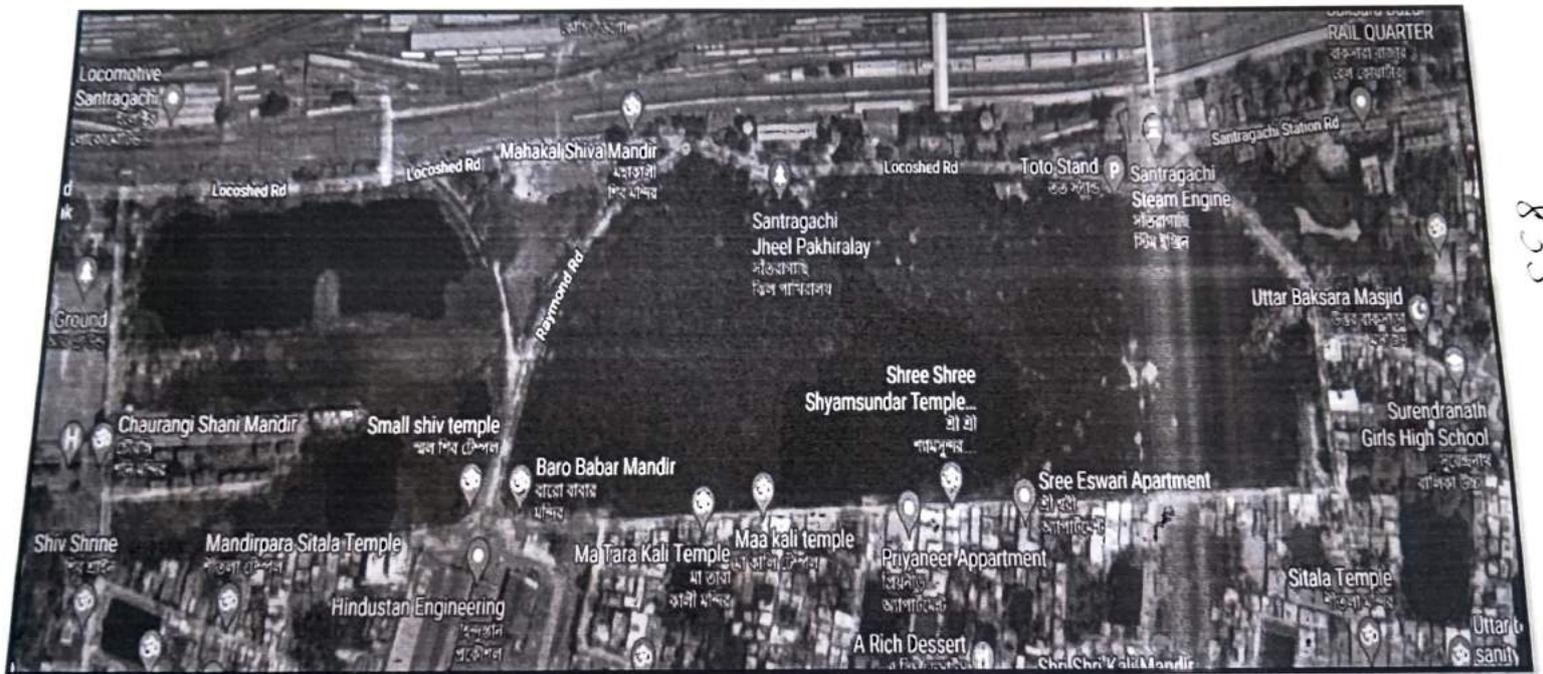
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833

# 1 Key Map



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## 2 Executive Summary

Santragachi Jheel is a popular large lake and biodiversity hotspot located next to the Santragachi Railway Station in Howrah District, West Bengal. This lake attracts large number of migratory birds in each winter. The composition of the lake bed has a significant impact on the flora and fauna found within the lakes. The water body provides a microorganism of living and non-living elements that are relatively dependent of their surrounding environments. Therefore, lake organisms have a significant role on its ecological balance.

The water body is being polluted due to discharge of untreated waste water from the surrounding residential and commercial complexes and also due to indiscriminate dumping of solid waste, plastic waste and garbage from local markets by the unauthorized occupants encroached upon the Jheel. The survey report identified near about 55 nos. outfalls which are ended up in the lake and identified 267 nos. of shops (shanty hutments) entered into the Lake water. There are possibilities of direct defecation into the lake water from these market congregations.

National Green Tribunal issued Order dated-30.09.2020 [O.A.No.06/2016/EZ] for abatement of pollution at Santragachi Jheel by providing effective steps from the end of all respondents [viz. Railways, HMC, L&LR Department, WBPCB and Environment Department]. Consequent to the follow up visits and minutes of discussions it was decided that:

- Garland drain to be constructed around all sides of the Jheel including Interception and diversion of all outfalls to convey the untreated effluents into the STP.
- The Jheel comprised of two parts one part is main Jheel which is about 36 acres and the 2<sup>nd</sup> part is about 15 acres. The STP and two pumping stations are considered on this 2<sup>nd</sup> part of the Jheel for treating the waste water by Waste Stabilization Pond (WSP).
- Provision has been made for discharge of spill over storm water discharge.
- Construction of Public Toilets.
- It is requested by the UD & MA Deptt. GoWB to the Railway authority for lease out the land and way leave permission to the HMC for the project free of cost.
- It is the responsibility of the administrative authority for eviction of unauthorized occupants in the Jheel.
- Periodic cleaning of the Jheel to be taken up by HMC.
- Periodic water quality report is requested from Appropriate Authority.
- The treated effluents will be discharged into the Nazirgaunge Khal.
- Cost sharing pattern of the project will be proportionately between SER and HMC is (65:35) on the basis of Sewage generation.

Accordingly, the DPR has been prepared as per the guide lines of CPIIEEO Manual for sewage treatment and sewerage network based on the prevalent Govt. Schedule of Rates amounting to Rs. 28.17 Cr. including 15 Years O&M.

Superintending Engineer  
GAP(W&S) Sector, KMDA

Superintending Engineer (E&M)  
GAP(W&S) Sector, KMDA

Chief Engineer  
GAP(W&S) Sector, KMDA

Chief Engineer (E&M)  
GAP(W&S) Sector, KMDA

CHECK LIST

1. Name of town-Santragachi, Howrah
2. Availability of land- page no.-4
3. Information of water body & Area – page no.-6
4. Topographical survey – Drawing-page no.-11
5. Population – page no.- 9-12
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12. Pert chart – page no.277-278



## 4 Background of Project

### 4.1 Brief Description of the Project Area

SantragachiJheel is one of the most important urban wetland of the District Howrah, W.B. The location of the jheel is (22°58'N and 88°27'E). The SantragachiJheel has received various sewage waters from the nearby localities of the Howrah Township. The total area of the SantragachiJheel is 10.87 hectares. The shape of the Jheel is roughly rectangular, the length is about 915 m. and width is 305 m., perimeters is 2418 m. and mean depth varies from 4 to 8 m. Santragachi Lake is a large Lake located next to the Santragachi railway station. It is famous as a natural Bird sanctuary and play an important role in zoological point of view. Many birds including migrant birds are coming to this lake. But due to pollution from outside sources the lake loses its habitat birds and fishes. The number has increase in recent years, as migratory birds have started to avoid destinations like the Lakes in alipore zoo, kolkata. Birds like Saras Crane from North America and Australia, Gadwall, Northern pintail, Northern Shoveler, Northern Pintail, Garganey from North of the Himalayas and many other local migratory birds such as cotton pygmy goose, Comb duck etc, are spotted seasonally. However, Lesser whistling duck is the most dominant species visible here. The Lake owned by south eastern railway, since August, 1992 and the Wild-life wing of the Forest Department, Govt. of West Bengal has taken up management and developmental work of this wetland. Every year before the migratory birds are expected to arrive, the forest department cleans water hyacinth from the Lake, though leaving some portion of it which adds up to an environment suitable for the birds. Santragachi Lake is surrounded on all sides by human habitation including railway quarters, shops, railway yard, a number of industrial units, domestic and commercial cattle sheds. Forest ministry of the State government of West Bengal intends to convert the Lake to a wildlife conservation centre.

The main pollution source of the Lake is coming from its neighbours. Many Household connections are directly discharging their sewage into the lake by household sewage outlets. Another reason is that some encroachment has been grown up besides the lake boundary and they are contributing pollution by dumping of waste materials and sewage outlets directly into the lake. Besides that it has observed that the south eastern railway also enlisted their name into the list as another pollution contributor of this lake. The sewage outlets of santragachi station and nearby railway quarters are all discharging into this lake.

Proper management of the area is essential for conservation of avifaunal diversity of this nationally important wetlands. From the railway point of view, the SantragachiJheel is the lifeline of the Santragachi station and its station yard. This jheel has been served as drainage channel, and as well as for emergency water requirement for railway yard. Santragachhi is the main railway coaching yard of South Eastern Railway's Kharagpur Division. It is a major junction of South eastern railway line.





Vidyasagar Setu and towards rest of the NH 16 and to the NH 19. Many buses start from Santragachhi towards several neighbourhoods like - KB15 (to Anandapur), ST19/1 (Mini) (to B.B.D. Bagh), EB1A (to Belgharia), VS12 (to New Town) etc. Many buses also pass through Santragachhi like - K11 (Domjur - RabindraSadan), 26 (Mini) (Unani - Esplanade), C11 (Domjur - B.B.D. Bagh/Belgachia), E6 (Amta - Esplanade), E7 (Bagnan - Esplanade) etc. A 10 km (6.2 mi) east-west Metro extension project from Howrah Maidan to Santragachhi bus terminus has been proposed.

#### 4.1.4 Industrial activities

Santragachhi is mainly known for its railway yard and many factories are established besides that railway yard. It is situated near within the Howrah municipal corporation area, which is a big municipal corporation of West Bengal. Howrah is maintained well developed infrastructural facilities that make the environment healthy for the promotion of new industries. Another advantage for its industrial growth is that it is a railway junction. Thus availability of skilled labour and raw materials is more easy. Good transport facility by rail, road, ferry and air routes are also helpful to connect different places for industrial development. The salient features of the policy on industrial promotion and economic development are to welcome foreign technology and investment, private sector investment in power generation, improvement and up gradation of industrial infrastructure.

#### 4.1.5 Educational activities

Here are several secondary and higher secondary schools for boys and girls. Sir Ashutosh Mukherjee laid the foundation stone of Santragachhi Kedarnath Institution, notable school in this area.[13] Other governmental schools include Santragachhi Bhanumati Balika Vidhyalaya, S.E. Railway Mixed Higher Secondary School, Santragachhi Mixed High School, and Santragachhi Railway Colony High School, Baksara High School, Surendranath Girls' School, Jagacha High School etc. Private schools include St. Marys Convent School, Maria's Day School. There is also a branch of Kendriya Vidhyalaya, which is affiliated to CBSE Board. Colleges in the area include Dr. Kanailal Bhattacharya College and Howrah Girls College.

#### 4.1.6 Soil characteristics and sub soil water level

Santragachhi is situated in gangetic region and the soil and ground water structure is same like other gangetic region. Tertiary basin with enormous thickness of fluvio-marine sediments has seen in this place. The Bengal Basin can be divided into three structural units viz. the westernmost shelf or platform, the central hinge or shelf/slope break and deep basin part in the east and southeast that presently open in the Bay of Bengal. Due to heavy exploitation of groundwater a major change has been occurred in the sub-surface water level condition of Howrah. Investigations conducted in Howrah region for the last few years reflect alarming depletion of Piezometric level.

## 4.2 Existing Sewerage Works

Wastewater is produced after usage of water in various household activities like bathing, flushing, washing, cooking etc. in households. The wastewater is also produced in commercial areas, industrial areas & institutional areas. All this wastewater ideally to be carried in underground sewerage system to the sewage treatment plant. The metropolitan cities and a few bigger towns of our country, no doubt, have generally been equipped with the facilities of modern sewerage system. But in case of



Santragachhiheel, some of the sewage water of adjacent municipal and railway areas is being discharged into open drainage network.

The entire waste water (storm as well as DWF) is conveyed through the existing surface drainage network and sewage network to the Santragachhiheel. It has been observed that considerable number of house hold which are illegally encroached in the bank of the jheel and its nearby area are generally dumped its waste and sewage water generates from households into the jheel. The effluent from nearby habitant houses and railway stations are all discharging into the jheel.

#### 4.2.1 Existing Drainage System

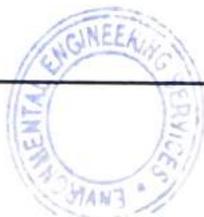
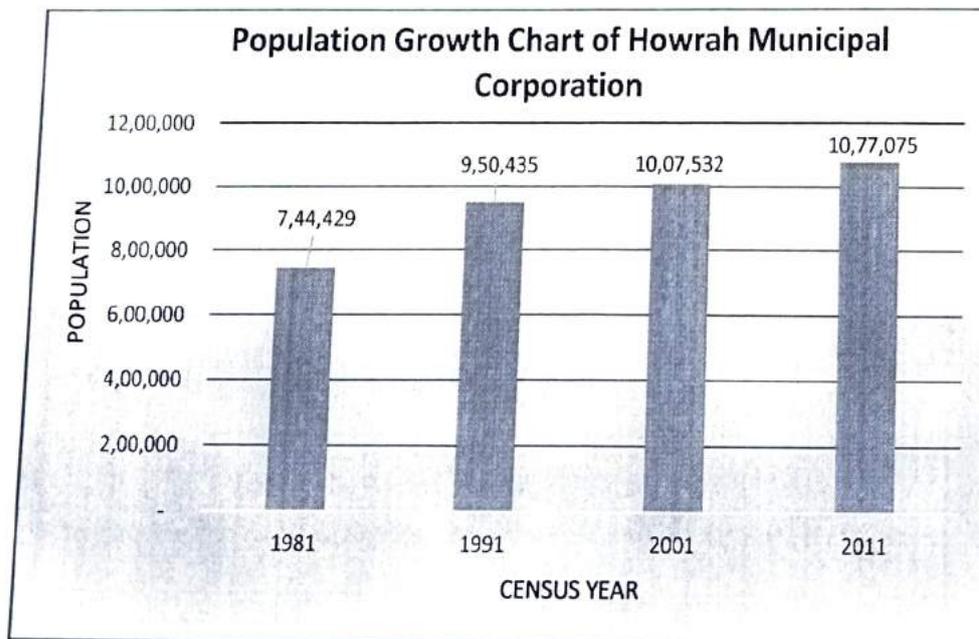
The characteristic feature of this riverine landscape is the levee formation, as a consequence of which the entire tract between Rupnarayan and Hooghly is divided into three broad but shallow troughs. In these shallow troughs, the low-lying areas contain a number of swamps, locally known as "jalas". These jalas are not able to drain out the water which accumulates during the rainy season.

The trends and outlets of natural drainage pattern of Howrah city claim a north-west to south-east flow of storm water. Such observations have led to the development of a robust drainage infrastructure over different time periods by the Howrah Municipal Corporation, to prevent any disaster from water logging in the city.

### 4.3 Population

As we discussed previously that a whole portion of the jheel is situated in the Howrah Municipal area. But presently it is taken care by Indian Forest Department. The people situated here also contribute to the pollution of the jheel. The detail of the census pollution and its projection of different municipalities have been stated below

**Howrah Municipal Corporation** is a growing municipality. From the above picture it has been shown that population of the municipality is increasing in every decade. Average population density of the municipality is 20,817 as per census 2011. The Decadal growth rate in Bidhannagar Municipality is shown in following chart:



### 4.3.1 Population Projections by different methods

Population projection has been estimated based on past 5 decades growth trends and adopting the best fit method. Comparing the projection trends from 1961-2001 with 2011 population, Methods which are used for projecting population are

- Arithmetical increase method
- Incremental increase method
- Geometrical increase method

The projected population is computed as per the method of projection that is more relevant (Best Fit) to the population of 2011 as per Census - 2011. That method which is best fitted for the population of 2011 should be adopted for projection of the later years. For this the population of Year 2001 was taken as base data and thereafter the population of year 2011 was projected using Arithmetic Progression, Geometric Progression and Incremental Increase Method. The Population projection of three municipalities has stated below.

#### *Howrah Municipal Corporation population projection:*

Population number of different census year has been stated below in Table 2.1. From that data we calculated the projected population of year 2011 by Arithmetic Increase, Geometric Increase and Incremental Increase method. After that it was compared with actual population of 2011 census and taking the suitable method for further progression. The detail calculation is as follows:

**Table 4-1: Different method comparison**

YEAR	CENSUS POPULATION	AIRTHMATIC INCREASE	GEOMETRIC INCREASE	INCREMENTAL INCREASE
1971	7,37,877			
1981	7,44,429	6,552	0.89	0
1991	9,50,435	2,06,006	27.67	199454
2001	10,07,532	57,097	6.01	-148909
TOTAL		2,69,655		50545
AVERAGE		1,31,552	0.13	-1,48,909

From this projected data, projected population of 2011 will be:

**Table 4-2: Comparison between actual and projected value**

Projection Method	Arithmetic Increase Method	Geometric Increase Method	Incremental Increase Method
Projected 2011 Population	11,37,439	11,39,084	9,90,175
Actual 2011 Census Population	10,77,075		

So, Arithmetic Increase Method is the best fit for projecting the population of Howrah Municipality area. The calculation process has been shown below:



**1. Arithmetical Increase Method:**

Population after nth decade will be,  $P_n = P + n.C$

$P_n$  = Population after 'n' decades;

P = Current population = 10,77,075(2011 census);

C = Rate of change of population;

**Table 4-3: Arithmetic Increase Calculation**

Year	Population	Arithmetic Increase
1981	7,44,429	
1991	9,50,435	2,06,006
2001	10,07,532	57,097
2011	10,77,075	69,543
C	Rate of Change in Population	84,800

C Rate of Change in Population 84,800

So,  $P_{2021} = 10,77,075 + (1.0 \times 84800) = 11,87,957$

$P_{2037} = 10,77,075 + (2.8 \times 84800) = 13,87,545$

**2. Geometrical Increase Method:**

Population after nth decade will be,  $P_n = P \cdot (1 + \frac{I_G}{100})^n$

$P_n$  = Population after 'n' decades;

P = Current population = 10,77,075(2011 census);

$I_G$  = Geometric Mean (%);

**Table 4-4: Geometric Increase Calculation**

YEAR	POPULATION	AIRTHMATIC INCREASE	GEOMATRIC INCREASE (%)
1981	7,44,429		
1991	9,50,435	2,06,006	27.67
2001	10,07,532	57,097	6.01
2011	10,77,075	69,543	6.90
$I_G$	Geometrical Mean		0.13

Process for calculating Geometrical mean:

$$1) I_G = [(P_{2011} / P_{1981})^{1/n}] - 1$$

$$2) I_G = [(GI_{1991}/100) \times (GI_{2001}/100) \times (GI_{2011}/100)]^{(1/n)}$$

The method (1) gives an imaginary value; therefore we do not consider this method of calculation for our project report.



$$\text{So, } P_{2021} = 10,77,075 \times \left(1 + \frac{0.13}{100}\right)^{1.0} = 11,89,836$$

$$P_{2037} = 10,77,075 \times \left(1 + \frac{0.13}{100}\right)^{2.8} = 14,23,382$$

### 3. Incremental Increase Method:

Population after nth decade will be,  $P_n = P + n.X + \{n(n+1)/2\}.Y$

$P_n$  = Population after 'n' decades;

P = Current population = 10,77,075(2011 census);

X = Average Increase;

Y = Incremental Increase;

**Table 4-5: Incremental Increase Calculation**

Year	Population	Arithmetic Increase	Incremental Increase
1981	7,44,429	-	
1991	9,50,435	2,06,006	
2001	10,07,532	57,097	-148909
2011	10,77,075	69,543	12446
Average		84,800	-68231.5

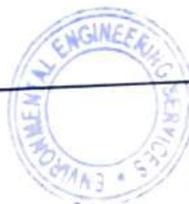
$$\text{So, } P_{2021} = 10,77,075 + 1.0 * 84,800 + \frac{1.0(1.0+1)}{2} * (-68231.5) = 10,93,643$$

$$P_{2037} = 10,77,075 + 2.8 * 84,800 + \frac{2.8(2.8+1)}{2} * (-68231.5) = 9,51,522$$

It is clearly shown that Incremental Increase method is best fitted for describing the nature of population growth of Bidhannagar Municipality. With the help of above mentioned methods we are further projecting the population growth of the Bidhannagar municipal area by taking 2024 as base year up to 15 years and 30 years. The projected population has shown in a tabular format in below.

**Table 4-6: Population Projection using Different Methods BMC**

	YEAR	Arithmetic POPULATION	Geometric POPULATION	Incremental Increase POPULATION
Last Census Year	2011	10,77,075	10,77,075	10,77,075
Current Year	2021	11,61,875	11,89,836	10,93,643
Base Year	2024	11,87,314	12,25,913	10,85,308
15 Years	2037	13,14,514	14,23,382	9,51,522
30 Years	2052	14,41,713	16,52,659	6,64,215



## 4.4 Water Supply

### 4.4.1 Recommended rates of water supply as per CPHEEO Manual on water supply

As per CPHEEO Manual on Water Supply and Treatment 1999, the recommended values of water supply for domestic and non-domestic purposes are given below:

Serial No	Classification of towns / cities	Recommended Maximum Water Supply Levels (lpcd)
1	Towns provided with piped water supply but without sewerage system	70
2	Cities provided with piped water supply where sewerage system is existing/ contemplated	135
3	Metropolitan and Mega cities provided with piped water supply where sewerage system is existing/ contemplated	150

*SOURCE: Table 2.1 of CPHEEO Manual on Water Supply and Treatment, May 1999.*

*NOTE:*

1. In urban areas, where water is provided through public stand posts, 40 lpcd should be considered.
2. Figures exclude —unaccounted for water (UFW), which should be limited to 15%.
3. Figures include requirements of water for commercial, institutional and minor industries. However, bulk supply to such establishments should be assessed separately with proper justification.

In santragachi area all the water has been discharged by Howrah municipality and in railway yard , SRC supplied the water separately.

## 4.5 Volume of Sewage Generation

At present there is no separate sewerage system for disposal of domestic waste water. Thus the open drains acts like combine sewerage system which carries household waste water and leachate from drain site solid waste dumping. The cumulative effect of all these pollutants leading to River Ganga through Nayanjully ditch from this town have resulted in deterioration of River Ganga.

### 4.5.1 Interception Factor

The observed dry weather flow reaching the sewer system is less than that of the per capita water supply due to loss of some water in leakage and evaporation. It varies from 40% of water supplied in arid regions to 90% in well developed areas. For design purposes, interception factor or return factor adopted as 0.80.

### 4.5.2 Peak Factors

Flow in sewers varies hourly and seasonally. However, for design purposes, peak factors may be adopted as per table 3.8. Minimum flow may vary from 1/3 to 1/2 of average flow.



Contributory Population	Peak Factor
Up to 20,000	3.00
20,001 to 50,000	2.50
50,001 to 750,000	2.25
Above 750,001	2.00

Source: Table 3.2 of CPHEEO Sewerage Manual 2013

### 4.5.3 Household Survey and corresponding Sewage generation

- We have also calculated the quantity of waste water on the basis of population generation. We have taken that 135lpcd water has been consumed by each person in the municipal area. As per recommendation of CPHEEO manual, the Interception factor was taken as 0.8, which means that 80% of the total water intake generates as waste water. (Recommended Per Capita Water Supply Levels for Designing Schemes as per CPHEEO manual)
- The population as per census 2011 of the adjacent wards of these three municipalities is taking as the base year. Then it is further projected up to 2054 years and on the basis of that population we calculate the future waste-water generation. We were considering only those Municipal ward areas for population projections which were situated besides the Santragachi Jheel.
- Sewage generation (MLD) =  $(0.8 \times 135 \times \text{Population}) / 1000000$
- The details of ward numbers of different municipal area is stated below along with its future waste water generation.

**Table 4-7: Railway yard Waste water generation on the basis of Population**

Railway yard		
Sl no	Block name	Unit
1	A/2	2
2	A/2/B	5
3	A/19	23
4	A/20	24
5	A/21	24
6	A/22	21
7	A/23	24
8	A/24	24
9	A/25	24
10	A/26	8
11	A/27	8
12	A/28	8



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Railway yard		
Sl no	Block name	Unit
13	A/29/A	8
14	A/30/A	8
15	A/31	8
16	A/32	8
17	A/33	8
18	A/34	6
19	A/35	8
20	A/36	2
21	B/2	2
22	B/3	1
23	B/4	1
24	B/6	5
25	B/6/1	1
26	B/7	6
27	B/7/1	1
28	B/8	1
29	B/9	3
30	B/10	1
31	B/11	1
32	B/12	10
33	B/13	2
34	B/14	1
35	B/15	1
36	B/16	4
37	B/17	4
38	B/18	4
39	B/19	4
40	B/20	4
41	B/21	4
42	B/26	4
43	B/27	4
44	B/28	4
45	B/29	16
46	B/30	4



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Railway yard		
Sl no	Block name	Unit
47	B/31	4
48	B/32	4
49	B/33	4
50	B/34	8
51	B/35	8
52	B/36	16
53	B/37	16
54	B/38	16
55	B/39	8
56	B/40	10
57	B/45	8
58	B/46	18
59	B/47	6
60	B/48	6
61	B/49	6
62	B/50	6
63	B/51	6
64	B/52	6
65	B/53	6
66	B/54	6
67	C/9	6
68	C/10	2
69	C/11	2
70	C/12	1
71	C/13	4
72	C/14	4
73	C/15	2
74	C/16	2
75	C/17	6
76	C/18	6
77	D/20	4
78	D/21	5
79	D/22	3
80	D/23	4



Railway yard		
Sl no	Block name	Unit
81	RPF/II	32
		595
Persons per unit:		5
		2975
Flow generation (MLD):		0.3213

**Table 4-8: Waste water generation from Nearby Household and Encroachment on the basis of Population**

Household		
Sl no	Block name	Unit
1	BoroJheel	200
2	Chotojheel	65
3	Encroach	75
4	Shop approx	10
Total		350
Persons per unit:		5
		1750
Flow generation (MLD):		0.189

Total current Flow (MLD):	0.5103
---------------------------	--------

#### 4.5.4 Sewage flow in drains/sewers

For our project, we carried out a survey of outfalls, which are ended up in SantragachiJheel. We find that the Santragachi Jheel has two parts one is Big lake and another one is small. Both of the lakes have exit drainage point from where the extra overflow water has passed towards the canal. The Big lake has 2nos 'Exit point' situated at the two corner of the lake and small lake has only 1 exit point. To understand the total sewage flow generation, we measured flow of open drain outfalls using rectangular weir principle method. We measured the flow of outfall channel for 8 hours on 4 different days of week including a holiday. Total Flow has been given in the below table with sewage treatment option taken as Waste Stabilization Pond (WSP) for its low costing.

*The detail of this bifurcation has given below:*

Location of New STP	Treatment Facility	Jheel Zone	Description of Outfalls	Capacity (MLD)
Within Existing small	Waste Stabilization	Big Jheel	Outfall 1 to Outfall 38	1.5



Santragachhi/Sheet	Pond (WSP)	Small Pond	Outfall 29 to Outfall 17	
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The map location of all the outfalls has been demarcated separately in a sheet and attached to the Annexure for better reference. The detail list of the Outfalls has mentioned in a separate Annexure below.



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Table 4-9: Detail of Outfall Survey Data

Outfall Name	Co-ordinate		DIMENSION (mm)		Water Depth (mm)	Velocity (m/sec)	Current Flow (2021)		Projected Flow (2037)		Projected Flow (2052)	
	X	Y	Width	Depth			cumec	MLD	cumec	MLD	cumec	MLD
OF-1	22.582424	88.282203	300	900	75	0.033	0.0008	0.0648	0.00086	0.0745	0.00098	0.08424
OF-2	22.582431	88.282417	300	500	45	0.037	0.001	0.043	0.00058	0.04968	0.00065	0.05616
OF-3	22.582526	88.284464	300	500	38	0.040	0.000	0.039	0.00052	0.0453	0.00059	0.05122
OF-4	22.58234	88.285517	300	500	75	0.028	0.001	0.054	0.00072	0.0621	0.00081	0.07020
OF-5.1	22.5827294	88.2878705	300	400	350	0.033	0.004	0.302	0.00403	0.34776	0.00455	0.39312
OF-5.2	22.5826	88.2878788	250	250	50	0.067	0.001	0.072	0.00096	0.0828	0.00108	0.09360
OF-5.3	22.5820474	88.2880178	250	300	50	0.067	0.001	0.072	0.00096	0.0828	0.00108	0.09360
OF-6	22.581452	88.287051	300	400	75	0.037	0.001	0.072	0.00096	0.0828	0.00108	0.09360
OF-7	22.580646	88.286489	250	300	20	0.030	0.000	0.013	0.00017	0.0151	0.00020	0.01702
OF-8	22.580471	88.286187	250	300	20	0.028	0.000	0.012	0.00016	0.0138	0.00018	0.01560
OF-9	22.580551	88.285463	250	300	25	0.022	0.000	0.012	0.00016	0.013800	0.00018	0.01560
OF-10	22.580633	88.285234	250	300	22	0.025	0.000	0.012	0.00016	0.013662	0.00018	0.01544
OF-11	22.580382	88.285009	250	300	20	0.026	0.000	0.011	0.00015	0.013073684	0.00017	0.01478
OF-12	22.580425	88.284981	250	300	15	0.029	0.000	0.010	0.00013	0.010959	0.00014	0.01239
OF-13	22.580501	88.284728	250	300	20	0.034	0.000	0.015	0.00020	0.017131	0.00022	0.01937
OF-14	22.580468	88.284686	250	300	15	0.038	0.000	0.012	0.00017	0.014331	0.00019	0.01620
OF-15	22.580473	88.284624	250	300	20	0.027	0.000	0.012	0.00016	0.013427	0.00018	0.01518
OF-16	22.580499	88.284581	250	300	20	0.026	0.000	0.011	0.00015	0.012738	0.00017	0.01440
OF-17	22.580499	88.284503	250	300	22	0.024	0.000	0.011	0.00015	0.013011	0.00017	0.01471

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Outfall Name	Co-ordinate		DIMENSION (mm)		Water Depth (mm)	Velocity (m/sec)	Current Flow (2021)		Projected Flow (2037)		Projected Flow (2052)	
	X	Y	Width	Depth			cumec	MLD	cumec	MLD	cumec	MLD
OF-18	22.580446	88.284466	250	300	20	0.022	0.000	0.010	0.00013	0.01104	0.00014	0.01248
OF-19	22.580527	88.284336	250	300	25	0.021	0.000	0.011	0.00015	0.0129375	0.00017	0.01463
OF-20	22.580525	88.284246	250	300	20	0.022	0.000	0.010	0.00013	0.011040	0.00014	0.01248
OF-21	22.580504	88.284175	250	300	15	0.022	0.000	0.007	0.00010	0.00828	0.00011	0.00936
OF-22	22.580509	88.284153	250	300	15	0.029	0.000	0.009	0.00012	0.0106457	0.00014	0.01203
OF-23	22.580494	88.284122	250	300	18	0.026	0.000	0.010	0.00013	0.0114646	0.00015	0.01296
OF-24	22.580453	88.284081	250	300	15	0.024	0.000	0.008	0.00011	0.0090878	0.00012	0.01027
OF-25	22.580474	88.28395	250	300	20	0.025	0.000	0.011	0.00014	0.01242	0.00016	0.01404
OF-26	22.580464	88.283901	250	300	15	0.025	0.000	0.008	0.00011	0.009315	0.00012	0.01053
OF-27	22.580484	88.283806	250	300	15	0.033	0.000	0.011	0.00014	0.01242	0.00016	0.01404
OF-28	22.580505	88.283705	250	300	22	0.040	0.000	0.019	0.00025	0.0218592	0.00029	0.02471
OF-29	22.580488	88.283329	250	300	22	0.037	0.000	0.018	0.00023	0.02024	0.00026	0.02288
OF-30	22.580396	88.283026	250	300	20	0.026	0.000	0.011	0.00015	0.013074	0.00017	0.01478
OF-31	22.580435	88.282834	250	300	15	0.020	0.000	0.006	0.00009	0.007452	0.00010	0.00842
OF-32	22.58049	88.282666	250	300	15	0.020	0.000	0.006	0.00009	0.007452	0.00010	0.00842
OF-33	22.580477	88.282419	250	300	20	0.018	0.000	0.008	0.00010	0.009033	0.00012	0.01021
OF-34	22.580461	88.282198	250	300	15	0.018	0.000	0.006	0.00008	0.006775	0.00009	0.00766
OF-35	22.580375	88.282046	250	300	15	0.036	0.000	0.012	0.00015	0.013307143	0.00017	0.01504
OF-36	22.580434	88.281768	250	300	20	0.029	0.000	0.012	0.00016	0.014194	0.00019	0.01605
OF-37	22.580415	88.281746	250	300	15	0.026	0.000	0.008	0.00011	0.009554	0.00013	0.01080

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Outfall Name	Co-ordinate		DIMENSION (mm)		Water Depth (mm)	Velocity (m/sec)	Current Flow (2021)		Projected Flow (2037)		Projected Flow (2052)	
	X	Y	Width	Depth			cumec	MLD	cumec	MLD	cumec	MLD
OF-38	22 580792	88 281349	250	300	20	0.027	0.000	0.012	0.00016	0.013427	0.00018	0.01518
OF-39	22 580303	88 278174	250	300	20	0.033	0.000	0.014	0.00019	0.016560	0.00022	0.01872
OF-40	22 580297	88 27803	250	300	15	0.029	0.000	0.009	0.00012	0.010646	0.00014	0.01203
OF-41	22 580226	88 277848	250	300	15	0.024	0.000	0.008	0.00010	0.008871	0.00012	0.01003
OF-42	22 580254	88 277715	250	300	20	0.020	0.000	0.009	0.00012	0.010139	0.00013	0.01146
OF-43	22 580262	88 276252	250	300	18	0.018	0.000	0.007	0.00009	0.007984	0.00010	0.00903
OF-44	22 580497	88 276195	300	600	15	0.016	0.000	0.006	0.00008	0.007097	0.00009	0.00802
OF-45	22 58051	88 27652	300	600	15	0.022	0.000	0.009	0.00012	0.009936	0.00013	0.01123
OF-46	22 580474	88 276821	300	600	20	0.030	0.000	0.016	0.0002091	0.018065	0.00024	0.02042
OF-47	22 580564	88 277069	300	600	25	0.029	0.000	0.019	0.0002464	0.021291	0.00028	0.02407
OF-48	22 58064	88 277176	300	600	20	0.033	0.000	0.017	0.0002300	0.019872	0.00026	0.02246
OF-49	22 580636	88 277608	300	600	20	0.033	0.000	0.017	0.0002300	0.019872	0.00026	0.02246
OF-50	22 580775	88 277734	300	600	15	0.029	0.000	0.011	0.0001479	0.012775	0.00017	0.01444
OF-51	22 580775	88 277734	300	600	20	0.025	0.000	0.013	0.0001725	0.014904	0.00020	0.01685
OF-52	22 581093	88 27835	300	600	25	0.026	0.000	0.017	0.0002270	0.019611	0.00026	0.02217
OF-53	22 582248	88 276795		600	100	0.005	0.000	0.022	0.0002934	0.025349	0.00033	0.02866
OF-54	22 58243	88 278175		600	100	0.005	0.000	0.023	0.0003093	0.026719	0.00035	0.03020
OF-55	22 582413	88 278835		600	100	0.005	0.000	0.023	0.0003011	0.026016	0.00034	0.02941
Total								1.3039		1.4995		1.6951



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It has clearly shown that waste-water generation on the basis of population is lower than the outfall survey report. The reason behind this difference may be stated as the Outfalls may carry not only from their respective wards but also accumulate much more water from the adjacent wards. NMCG guideline is also suggested to take the higher value between the flow generation by survey and Population wise flow generation. Therefore total quantity of flow form survey report of the outfalls i.e. 1.5 MLD has considered as the waste-water generation (15 years) that needs to be treated for the pollution abatement for Santragachi Jheel.

**Table 4-10: Sample Picture of the Outfalls & survey**

	
<p><i>Outfall near railway Bazar area</i></p>	<p><i>Exit Point of Bigger Lake</i></p>
	
<p><i>Outfall falling into Small jheel</i></p>	<p><i>Series of Outfalls coming from nearby residence</i></p>
	
<p><i>Survey by Total station</i></p>	<p><i>Outfall measurement survey</i></p>



## 4.6 General Sewage Quality

We had done other similar types of project in past. The average testing result of those municipality outlets are summarised in the below table. The testing of sewage parameters and its analysis was conducted by R. V. Briggs & Co. Pvt.Ltd., at Bentinck Street, Kolkata to know the quality of waste water samples. The testing agency has all the required credentials and NABL approved accreditation for the testing of sewage parameters. The summary of testing result is given below:

Test Parameters	Unit	Value
pH	-	7.2
Total Suspended Solids	mg/L	105
Ammonical Nitrogen, NH <sub>4</sub> -N	mg/L	4.1
BOD – 5 days 20°C	mg/L	30
COD	mg/L	142
Dissolved Phosphates	mg/L	1.2
Total Coliform/100ml	CFU	2176
FeacalColiform/100ml	CFU	1075

Note: we are taking BOD= 50 mg/l as an adverse condition for designing the WSP

## 4.7 Treated Sewage Quality

Under National River Conservation Plan (NRCP), the effluent standards in respect of BOD and SS were followed as 30 & 50 mg/l. These were made more stringent and revised to 20 & 30 mg/l for BOD and SS respectively, for critical stretches of River Ganga, by the Ministry of Environment, Government of India on 3.2.2010.

Parameters	Units	Effluent Standards for discharge into water bodies		Effluent Standards for discharge on land
		Standards for non-critical stretches of river Ganga	Standards revised on 3.2.10 for critical stretches of river Ganga	
pH		5.5-9.0	5.5-9.0	
BOD	mg/L	30	20	100
TSS	mg/L	50	30	200
Faecal Coliform	MPN/100ml	Desirable – 1000 Permissible - 10000	Desirable – 1000 Permissible - 10000	Desirable – 1000 Permissible - 10000

### 4.7.1 Standards for treated sewage

CPCB, vide its letter dated Apr 21, 2015, has issued directions to all State Pollution Control Boards for adopting the revised effluent discharge standards for sewage treatment plants.



Parameters	Units	Parameters Limit (Standards for new STPs design after notification date)
pH		6.5-9.0
BOD	mg/L	Not more than 10
COD	mg/L	Not more than 50
TSS	mg/L	Not more than 20
NH4-N	mg/L	Not more than 5
Total N	mg/L	Not more than 10
Faecal Coliform	MPN/100ml	Not more than 100

Note:

- (i) These standards will be applicable for discharge in water resources as well as for land disposal. The standards for Faecal Coliform may not be applied for use of treated sewage in industrial purposes.  
(ii) \*Achievements of Standards for existing STPs within 05 years from the date of notification.

Effluent parameters as decided in the 11th meeting of Empowered Steering Committee (ESC) of NGRBA held on May 5, 2015 are as follows:

Parameters	Units	Limits
BOD		10
TSS	mg/L	10
TN	mg/L	10
Faecal Coliform	MPN/100ml	230

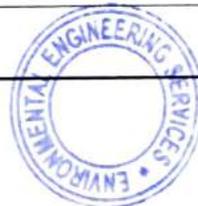
#### 4.7.2 Summary of treated effluent quality of existing STP

MoEFCC has also uploaded, on its web site, the Draft Revised Effluent Standards for Sewage Treatment Plants, on Nov 24, 2015.

Industry	Parameters	Units	Standards for new STPs (Design after notification date)*
Sewage Treatment Plant	pH		6.5-9.0
	BOD	mg/L	10
	COD	mg/L	50
	TSS	mg/L	20
	NH4-N	mg/L	5
	Total N	mg/L	10
	Faecal Coliform	MPN/100ml	<100

Note:

- (i) All values in mg/l except for pH and Coliform.  
(ii) These standards will be applicable for discharge in water resources as well as for land disposal. The standards for Fecal Coliform may not be applied for use of treated sewage in industrial purposes.  
\*Achievements of Standards for existing STPs within 05 years from the date of notification.



## 4.8 Other source of pollution

Accumulation of solid waste in open areas is an eyesore, diminishing real estate and property value, a breeding ground for insects and other vectors (rats and mice, wild and domesticated animals). It also causes odour nuisance, reflects the unorganized nature of the community and creates a poor environment for growing children.

### 4.8.1 Quantity of Solid Waste at the Bank:

Improper and unorganized disposal of Municipal Solid Waste (MSW) in open areas and landfills have a negative impact on the living conditions of human beings as well as the overall environment. It results in spread of communicable and non-communicable diseases among human beings and animals, thus affecting the welfare, livelihood and economic productivity. In addition, it causes contamination of soil, rivers, surface water, ground water and generation of toxic & greenhouse gases. In recent years, the water-body has become grossly polluted as most of the solid waste being generated in our society is ultimately disposed of into water bodies. Also the pollutants generated in the catchment area of the river, canal is transported regularly or occasionally by leaching, drainage and surface water runoff during the monsoon. The main pollutants are topsoil, plant residues, dumped garbage and dead bodies, agricultural residues etc. SantragachiJheel is also facing the same problem of solid waste dumping. The hutments that are placed near the bank of SantragachiJheel are often dumping their wastes into the water or on the bank. The municipalities are established some dumping yard for disposing of waste but many of times public does not used it. That ultimately increased the pollution level of SantragachiJheel. Disposed solid wastes choked some of the outfall opening which increased water problem in rainy season. The illegal dumping of solid waste is hindering the natural flow of the canal and increasing the sludge content of the Canal. This also helps to the breeding ground of the mosquitoes which is an alarming fact of recent dengue outbreaks. We have surveying the total stretch of the canal on both sides. A sample picture of the dumping waste has given below.

**Figure 4-2: Throwing Solid waste on the bank of Jheel**



People have encroached upon SantragachiJheel over the last four to five years but there hasn't been anyone to crack down on the illegal occupants. Garbage thrown into the canal by encroachers has

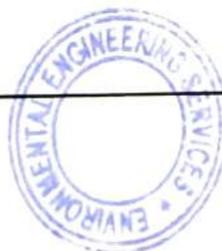
stopped the flow of water and thereby turning the canal into mosquito breeding ground. This ultimately causes the dengue outbreaks in nearby areas. Encroached hutments are also blocking the space of the bank which makes disturbance of cleaning the canal or dredging out the silt materials. Our present survey is showing the approximate number of hutments that are stayed on both the bank of the canal illegally. A sample picture of encroachment has given below.

**Figure 4-3: Encroachment near the bank of canal besides canal side road**



**Table 4-11: Solid waste dumping & Encroachment survey report**

Location name	Co-ordinate		Type
	Start	End	
1.1	22.582386, 88.285575	22.582599, 88.285865	Shops
1.2	22.582599, 88.285865	22.581811, 88.286892	Shops
1.3	22.582007, 88.286484	22.581415, 88.286878	Hutments
1.4	22.582598, 88.285881	22.581518, 88.287063	Shops
1.5	22.581518, 88.287063	22.581653, 88.287826	Hutments
1.6	22.582598, 88.285881	22.582787, 88.288298	Shops
1.7	22.582598, 88.285881	22.582422, 88.286517	Hutments
1.8	22.581528, 88.276076	22.581469, 88.277613	Hutments
Total Number of Hutments including shops:			267



## 5 Proposal of Project Scheme

The concept of Interception and Diversion model is first broadly accepted for cleaning of Ganga River in different region of India. Pollution of different Tributaries and Jheel which are connected with Ganga are also playing a vital role as the pollution source of Ganga. So cleaning of those water bodies will also help to clean the Ganga River indirectly. However, this noble cause of NGRBA and NMC Co, cleaning Ganga is not fully possible until, every town on the bank of Ganga, will stop discharging any waste water in to the River or connecting Jheels. But in practical, the entire nation, in some way or other, directly or indirectly, is discharging most of the wastewater in various Rivers or Water bodies. Until house to house connection is not provided, to collect the waste water, it is not possible to clean our Rivers and Jheels. Our project is to intercept outfalls that are falling into the Santragachi Jheel, and divert them to sewerage system, to partially fulfil the mission for cleaning the Jheel.

### 5.1 Design Periods of Various Components

The length of time up to which the capacity of a sewer will be adequate is referred to as the design period. In fixing a period of design, consideration must be given for the useful life of structures and equipment employed, taking into account obsolescence as well as wear and tear, the ease or difficulty of extending or increasing or addition of the works including a consideration of their location, design constraints, the anticipated rate of growth of the population with due regard to increase in commercial and industrial needs and the economic justification linked to the rate of interest and inflation. The project components may be designed for the periods are mentioned in the table below:

**Table 5-1: Design Periods of Various Sewerage Components**

COMPONENTS	Design period (years) from base period 2023
Land Acquisition	30 years or more
Sewer lines (Conventional)*	30 (2052)
Sewer Lines (Non-conventional)**	15 (2037)
Pumping Main	30 (2052)
Pumping Station (Civil Work)	30 (2052)
Pumping Machinery	15 (2037)
Sewage Treatment Plant	15 (2037)
*Typical Underground sewers with manholes laid in the roads	
**All types such as shallow sewer, pressure sewer, vacuum sewer, small bore etc.	

### 5.2 Our Proposal for Santragachi Jheel Pollution abatement scheme

Lake Zone	Outfalls	Generated Capacity for 15years (MLD)	Proposal
Santragachi Railway	1 to 5.3	0.75 MLD	Divert the generated sewage towards Jackpush trench and then it delivers



Lake Zone	Outfalls	Generated Capacity for 15years (MLD)	Proposal
station & Quarter Area			into the Inlet Pump house New RCC pipe carrying chamber has been proposed to deliver the pipe below the culvert junction
Residence area near Jheel	6 to 38	0.48 MLD	Divert the generated sewage towards Jackpush trench and then it delivers into the Inlet Pump house
Residence area near small Jheel including Railway quarter	39 to 55	0.28 MLD	Divert the generated sewage towards the New Proposed Inlet Lifting station.
Waste Stabilization Pond	Pond-1	Total 4.5m Height, 5 days detention period	
	Pond-2	Total 3m Height, 5 days detention period	
	Pond-3	Total 2.5m Height, 2 days detention period	
Pump Houses	2 nos.	1.5 MLD pump house for delivering sewage into WSP 7.5 MLD pump house for discharging treated sewage into nearby canal	

### 5.3 Proposed Scope of Work

- Total outfalls = 57
- Diversion Pipe line from I&D structure to Gravity Network Manholes 305m, Dia of Diversion Pipelines varies from = 300 mm
- Total of Gravity main pipeline = 3400m
- Dia of Gravity main pipeline varies from = 250mm to 500mm Total Number of Manholes = 173
- Rising main pipeline is provided to transport sewage from proposed Pump houses = 1195m Dia of Rising main pipeline varies from = 250mm to 450mm
- One RCC pipe carrying Chamber to carry the pipe from Jheel connection.
- Lifting stations proposed to transport the Waste water to Treatment plant =1 number and another lifting station is proposed to deliver the treated water to Nazirgaunge Canal. Summary of Pumping stations are stated in Table 8.1.
- Consultant is proposing STP will need to be constructed within the Santragachi jheel boundary for the treatment of the total sewage generation of 1.5 MLD. In this pond system the first pond depth is taken deeper to counter the odour problem, so that upper portion of the pond acts as Aerobic pond. The details are given in Table 8.2
- The authority UD & MA Deptt. GoWB has requested to the Railway authority for lease out the land and way leave permission to the HMC for the project free of cost.
- To control the odour problem we increase the depth of anaerobic pond which act as facultative pond, bottom portion of the pond act as anaerobic and upper portion act as aerobic thus it reduces the odour.



- Total 267 numbers of illegal hutments and shops are present encroaching the bank of the Jheel which are indiscriminately dumping solid waste and liquid waste into the Jheel some directly defecating into the Jheel and which are a serious threat to the bio-diversity of the Jheel. Need immediate removal to protect the water body.
- It is considered that administration should take necessary steps for eviction of these encroachment hence the source of pollution from these illegal encroachments are not considered in this DPR to mitigated.
- Due to influx in population some local market already grew up besides road a little further away from the jheel but inside the catchment area of the jheel. During the monsoon the entire Catchment area got inundated and thus carrying pollutant to the jheel. To mitigate the issue provision have been kept to discharge the storm water through pumping station outlet having a capacity of 7.5 MLD.

**Table 5-2: Proposed LS details**

Pump Station Name	Capacity (MLD)	Co-ordinate of the Identified Land	Location of Identified Land
LS-Inlet	1.5	22.580861, 88.279472	Near industrial plant of Hindustan Industrial Engineering Ltd.
LS-Outlet	7.5	22.581353, 88.277238	Besides newly proposed Maturation pond at small Jheel area

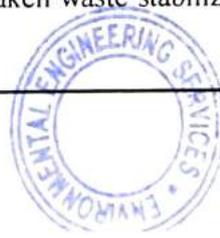
**Table 5-3: Proposed STP**

Location of New STP	Treatment Facility	Jheel Zone	Description of Outfalls	Capacity (MLD)
Within Existing small Santragachi Jheel	Waste Stabilization Pond (WSP)	Big Jheel	Outfall 1 to Outfall 38	1.5
		Small Jheel	Outfall 39 to Outfall 55	

**Table 5-4: Storm water calculation**

STORM WATER CALCULATION		
Total area considered	399337	Sq.m
Yearly Rainfall	1800	mm
taking 4 months of rainfall generation (120 days)		
so per day rainfall will be $= (1800/120)$ mm	15	mm
	0.015	m
Total rainfall generation = area x per day rainfall	5990.055	Cum/day
Total Rainfall Generation	6	MLD

We are proposing that all the outfalls which are carrying sewage and falling into the Jheel will be intercepted and diverted towards the STP area. A small Jheel which is situated besides the Big Jheel are selected for facilitating new STP. We have taken waste stabilization Pond (WSP) as our sewage





$$\text{Peak Flow} = 2.25 \times 0.262 = 0.589 \text{ MLD} = 24.542 \text{ m}^3/\text{hr} = 6.818 \text{ lps}$$

We are taking Pipe Material as HDPE/UPVC of Pipe Dia = 250 mm

Gradient, we provided = 1/1000

So, I.L. of the new pipeline will be = Start I.L. - (Length x Gradient)

$$= 98.613 - (20 \times (1/1000)) = 98.613$$

So, I.L. of the new pipeline at the End note: MH-1.3 will be **98.613**

Now, taking Manning's  $n = 0.01$  for HDPE pipe material of 250mm diameter ;

$$\text{Velocity at Sewer Line, } v = \frac{1}{n} r^{2/3} s^{1/2} = 0.681 \text{ m/sec}$$

$$\text{So, Discharge, } Q = VA = 0.681 \times \frac{\pi}{4} \times 0.25^2 = 85.603 \text{ lps}$$

$$\text{So, } q/Q = 6.818/85.603 = 0.08;$$

We get corresponding,  $d/D = 0.188$ ;  $v/V = 0.588$  from CPHEEO manual, page-3.31; Table-3.12

Actual Velocity,  $v = 0.681 \times 0.588 = 0.401 \text{ m/sec}$

As,  $d/D < 0.8$ ; the design is safe.

- i. Rest of the pipe design is attached in Annexure.

#### ***Diversion Pipeline:***

The diversion pipe will receive the flow from I&D chamber and divert the flow to the nearest manhole. Total 57 numbers Diversion Pipelines (DSP) of 523 m length has been proposed. The dimensions of the diversion pipelines are given below. Details of diversion pipelines are attached in the annexure.

#### ***Gravity main Pipes:***

Total of 3400m of High density polyethylene (HDPE) pipes are proposed to carry the intercepted sewage to the respective Pumping Stations (LS). Manholes (MH) are provided after 20m of intervals. Sometimes the manhole interval has changed according to the connection of the nearest diversion pipeline and outfalls. When Gravity main pipes are reached to certain depth of 4m from G.L., the Lifting station has provided to lift the water up to an acceptable height to continue the flow of sewage to its destination. The purpose of the providing Lifting stations is to avoid the intrusion of gravity main pipes to the Ground water (G.W.L) depth of that area. The design of the Gravity main pipelines is also same as the Diversion Pipeline as it was discussed earlier of this chapter. The detail of the Gravity main pipeline design is attached in **Annexure**.

## **5.6 Sewage Pumping Stations**

Two sewage pumping stations has been chosen in this project. One pumping station (LS-inlet) will be operated to deliver the total sewage that is collected in the sump well towards the first pond of WSP. Another one has selected (LS-outlet) to deliver the treated water towards the nearby canal named as Mou-canal. This canal is situated 1000m away from our new WSP.

As per CPHEEO guideline, design period up to 15 years is considered for pumps. The civil structure and the pipelines shall be adequate to serve for the design period of 30 years.



For SantragachiJheel Project, 30 years projected flow of Proposed New inlet Lifting Station is 1.5 MLD. Taking 2.25 as peak factor, Peak flow will be = (2.25 X 1.7) = 4 MLD

Q, Flow		MLD	m <sup>3</sup> /hr	m <sup>3</sup> /min	m <sup>3</sup> /sec	lps
	Average Flow	1.7	70.548	1.181	0.020	19.676
	Peak Flow	3.810	158.733	2.646	0.044	44.092

Head required is 9m. Hydraulic Retention Time (HRT) for wet well is taken as 15 min as per CPHEEO guidelines, Volume of Wet Well will be = 15 X 3.810/4 = 9.921 m<sup>3</sup>;

Considering, liquid depth of sump will be 2.0m,

Area required for sump well will be = 9.921/2.0 = 4.96Sq.m.;

Required Diameter of the sump well will be =  $\sqrt{\frac{4 \times 4.96}{\pi}} = 2.6m \approx 2.6 m$ ; . . . . . (i)

Total 5 nos. of Pumps are arranged at the both side of the common platform into the pump house. But to avoid the cavitation problem between two consecutive pumps, the minimum centre to centre distance is provided as 0.6m. We are taking centre to centre (c/c) distance between two pumps as per the capacity of pump motor, which is described below:

Pump Motor	C/C Distance
0-25 KW	600 mm
25-75 KW	900 mm
ABOVE 75 KW	1200 mm

Three (3) pumps will be placed at one side and on the other side Two (2) pumps will be placed.

So, Diameter of the wet well will be = (3 x Pump width) + (2 x C/C distance) + Clear distance

= (3 x 0.5) + (2 x 0.6) + 1.5 = 4.2 m . . . . . (ii)

Diameter provided as higher between (i) and (ii) = 4.2 m

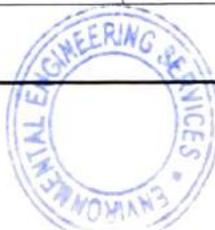
For 4.2m diameter of wet well, the area of well = 13.85 Sq.m and liquid depth = 9.921/13.85= 0.8m

Provide 0.6m Free Board. Wet well dimension of Proposed New Lifting Station-1 will be –

4.2 m Diameter X 0.8 m Liquid Depth + 0.6 m Free Board

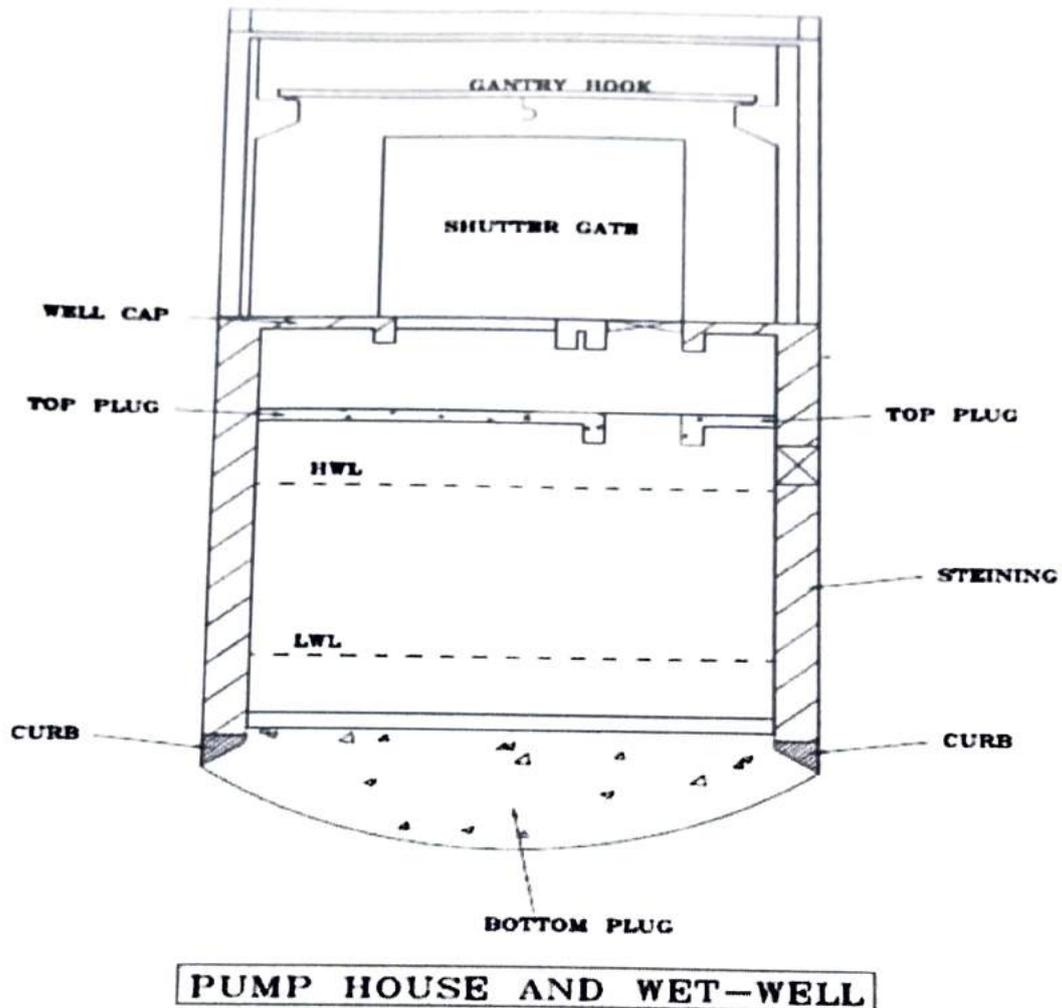
The same process has followed to calculate the dimension of the wet well for outlet pump house.

Summary of Pump Station Civil Design					
30 years Capacity (MLD)	15 years Capacity (MLD)	Location	Diameter, m	Liquid Depth, m	Free Board, m
1.8	1.5	Near Hindustan Industrial Engineering Ltd.	4.2	0.8	0.6
9.0	7.5	Besides newly proposed Maturation pond	5.7	2	1



### 5.6.1 Design of capacities of Pumping Plants of sewage pumping stations

The civil works of sewage pumping stations proposed under this DPR has been designed for 30 years span and ultimately it would have become a part of the town's integrated and comprehensive system of dealing with wastewater. However, considering modular approach, civil structures of the pumping houses has designed for 30 years and the machinery items had designed for 15 years as per CPHEEO manual.



### 5.6.2 Design of capacities of Pumps

The configuration of sewage pumps adopted as per CPHEEO guidelines for 15 years, for different Lifting Station which will be –

Pump Station	Pumps	No. of pumps
For Small Pumping Station	1 – Dry Weather Flow	1 Unit



Pump Station (~1,000 MLD)	Pumps	No. of pumps
For Large Pumping Station (~1,000 MLD)	2 Dry Weather Flow	1 Unit
	3 Dry Weather Flow	1 Unit
	1 Dry Weather Flow	2 Units
	1 Dry Weather Flow	2 Units
	3 Dry Weather Flow	1 Unit

The maximum flow that may come into the pump house has been taken as 2.25 times (2.25-DWF) of the average flow (as, Peak factor is 2.25). So 3-DWF capacity of water will not consider in our case. Now, for small pumping station we provide 1 pump of 1-DWF (1W), 1 pump of 2-DWF (1W) and 1 pump of 2.25-DWF (1W). For large pumping station we provide 2 pumps of 1/2-DWF (1W+1S), 2 pumps of 1-DWF (1W+1S) and 1 pump of 2.25-DWF (1W).

For Santragachi Lake Project, all the pump stations are designed to discharge over 1.0 MLD capacity. So, pumping arrangements are 2 pumps of 1/2-DWF (1W+1S), 2 pumps of 1-DWF (1W+1S) and 1 pump of 2.25-DWF (1W). Total 2nos of pumping stations are required. It was mentioned in the CPHEEO manual that the design period should be taken as 15 years for the pumping machinery and other electro-mechanical arrangements. The specific gravity of sewage is 1.03.

For example, we have calculated the 15 years projected flow for Proposed New Inlet Lifting Station is 1.5 MLD. It means average flow (1-DWF) to be pumped by the pump motor will be  $1.5 \times 10^6 = 1500 \text{ m}^3/\text{day}$ . The operating time of the pumps has taken as 24 hours a day. So, required capacity of the pumps will be  $= (1500/24) = 62.5 \text{ m}^3/\text{hr}$

Likewise, for 1/2-DWF capacity, the amount of flow to be pumped will be  $1500/2 = 750 \text{ m}^3/\text{day}$  and operating time will be 24 hours a day. So, required capacity of the pumps will be  $= (750/24) = 31.25 \text{ m}^3/\text{hr}$

Again for peak factor of 2.25, the maximum flow will be 2.25 DWF. So, 2.25-DWF flow will be  $1500 \times 2.25 = 3375 \text{ m}^3/\text{day}$  and operating time will be 24 hours a day. So, required capacity of the pumps will be  $= (3375/24) = 141 \text{ m}^3/\text{hr}$

Calculation for Motor Capacity:

Discharge,

For 1-DWF will be  $= 63 \text{ m}^3/\text{hr} = 17.5 \text{ lps}$ ;

For 1/2-DWF will be  $= 32 \text{ m}^3/\text{hr} = 8.89 \text{ lps}$ ;

For 2.25-DWF will be  $= 141 \text{ m}^3/\text{hr} = 39.17 \text{ lps}$ ;

$$1. \text{ BHP for 1-DWF} = (Q \text{ in lpm} \times \text{Head in m} \times \text{Sp. Gravity}/4500) / \text{Pump Efficiency [80\%]}$$

$$= 2.704 \text{ HP}$$

Taking 15% margin as per manual

$$\text{Energy Required} = 21.830 / (1 - 0.15) = 4 \text{ HP} = 2.018 \text{ KW}$$

$$2. \text{ BHP for 1/2-DWF} = (Q \text{ in lpm} \times \text{Head in m} \times \text{Sp. Gravity}/4500) / \text{Pump Efficiency [80\%]}$$

$$= 1.373 \text{ HP}$$

Taking 15% margin as per manual

Energy Required =  $10.95 / (1 - 0.15) = 2 \text{ HP} = 1.025 \text{ KW}$

$$1. \text{ BHP for 2.25 DWF} = (Q \text{ in lpm} \times \text{Head in m} \times \text{Sp. Gravity} / 4500) / \text{Pump Efficiency [80\%]}$$

$$= 6.051 \text{ HP}$$

Taking 15% margin as per manual

Energy Required =  $49.135 / (1 - 0.15) = 8 \text{ HP} = 4.516 \text{ KW}$

So, we are proposing that in Proposed New Lifting Station-1, the arrangements will be:

2 nos. of 4HP pumps for 1-DWF, 2 nos. of 2 HP pumps for 1/2-DWF & 1 no. of 8 HP pumps for 2.25-DWF

Power Calculation:

Total incoming load from (1DWF + 1/2DWF) pumps will be -

$$= 6 \text{ HP}$$

$$= 4.478 \text{ KW} = 4.975 \text{ KVA}$$

Taking a miscellaneous load of 2%, Total Load = 5.075 KVA

Total incoming load from 2.25DWF pumps will be -

$$= 8 \text{ HP}$$

$$= 5.970 \text{ KW} = 6.633 \text{ KVA}$$

Taking a miscellaneous load of 2%, Total Load = 6.766 KVA

Calculation for D. G. Set:

For, 1DWF + 1/2 DWF:

Considering 10% margin and 0.8 power factor for Q/2 flow =  $\text{Load} \times 1.1/2 \times 0.8$

$$= 3.489 \text{ KVA} \approx 4 \text{ KVA}$$

Check for Starting current;  $\text{KW} = 1.7321 \times \text{V} \times \text{I} \times \text{PF}$

$$= 7.786 \text{ AMP}$$

Current of Auxiliary Load =  $9.5\% \times 7.786 = 0.740 \text{ AMP}$

Total Current when one pump running = 8.526 AMP

For, 2.25DWF:

Considering 10% margin and 0.8 power factor for Q/2 flow =  $\text{Load} \times 1.1/2 \times 0.8$

$$= 4.652 \text{ KVA} \approx 5 \text{ KVA}$$

Check for Starting current;  $\text{KW} = 1.7321 \times \text{V} \times \text{I} \times \text{PF}$

$$= 10.382 \text{ AMP}$$



Starting Current of Pump on Soft Starter =  $4 \times 10.382 = 41.527$  AMP (As we are using Star Delta Motor, starting current requirement is 4 times of motor rating)

Total Current = 50.053 AMP

DG Sets are designed to withstand 50% overload for 30 Seconds

=  $(50.053 / 1.32) = 37.919$  AMP = 27.28 KVA = 45 KVA (nearest market availability)

Hence we are proposing 45 KVA Diesel Generator and Transformer for 1.5 MLD Proposed New Lifting Station-1

Similarly we have calculated motor capacity, power consumption and capacity of DG set with Transformer for outlet pump house. The details are stated below:

PUMP STATION	Pumps	No. of pumps	DG Capacity
7.5 MLD	½ - Dry Weather Flow (156 m <sup>3</sup> /hr)	2 Unit	250KVA
	1 - Dry Weather Flow (312 m <sup>3</sup> /hr)	2 Unit	
	2.25 - Dry Weather Flow (702m <sup>3</sup> /hr)	1 Unit	

## 5.7 Rising Mains

The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night. Total length is 1195m.

## 5.8 Sewage Treatment Plants

Sewage treatment is the process of removing contaminants from wastewater, primarily from household sewage. It includes physical, chemical, and biological processes to remove these contaminants and produce environmentally safer treated wastewater (or treated effluent). A by-product of sewage treatment is usually a semi-solid waste or slurry, called sewage sludge that has to undergo further treatment before being suitable for disposal or land application.

Sewage treatment may also be referred to as wastewater treatment, although the latter is a broader term which can also be applied to purely industrial wastewater. For most cities, the sewer system will also carry a proportion of industrial effluent to the sewage treatment plant which has usually received pre-treatment at the factories themselves to reduce the pollutant load. If the sewer system is a combined sewer then it will also carry urban runoff (storm water) to the sewage treatment plant. Sewage water can travel towards treatment plants via piping and in a flow aided by gravity and pumps. The first part of filtration of sewage typically includes a bar screen to filter solids and large objects which are then collected in dumpsters and disposed of in landfills. Fat and grease is also removed before the primary treatment of sewage. In this project we have chosen WSP process for sewage treatment purpose.

**Waste Stabilization Pond:**

Stabilization ponds are open, flow-through earthen basins designed and constructed to treat sewage and provide comparatively long detention periods extending from a few to several days. During this period the organic matter in sewage is stabilized in the pond through a symbiotic relationship as illustrated in Figure 5.3 earlier. Lightly loaded ponds are also used as a tertiary step in sewage treatment for polishing of secondary effluents and destruction of coliform organisms and are called maturation ponds. In warm climate countries, the pond systems are cheaper to construct and operate compared to conventional methods. They also do not require skilled operational staff and their performance does not fluctuate from day to day. The only disadvantage of pond systems is the relatively large land that they require, but this is sometimes over-emphasized. In addition, land on the outskirts of a growing city can be a worthwhile investment. Pond systems must be considered as an alternative when treatment of sewage or upgrading of existing facilities are planned and the life time costs of various other treatment system should be calculated and compared. The design calculation has stated below.

The depth of the first pond has been provided in deeper depth to counter the odor problem as the upper depth of the pond acts as Aerobic pond.



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WASTE STABILISATION POND DESIGN

Q (Generated Flow) =	1.5	MLD		
	1,500	m <sup>3</sup> /day		
BOD5 (Li) =	50	mg/l		
Final BOD5 will be less than	10	mg/l		
pH =	7.8-8.0			
Coliforms =	10 <sup>7</sup> /100	ml		
Latitude =	22°N			
Average visible radiation as per Latitude,				
Maximum =	165	cal/cm <sup>2</sup> /day		
Minimum =	105	cal/cm <sup>2</sup> /day		
Sky clearance factor =	75%			
Average ambient air temperature in January =	19	°C	Summer =	32 °C
Population (15 years projection) =	5,434			

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(a) Anaerobic Pond

Volumetric surface BOD loading according to temperature correlation =	=	$L_s = 350 \cdot (1.107 - 0.002 \cdot T)$	for 19°C temp
		235	gm/m <sup>3</sup> day
Assume the net evaporation rate is (e) =		5	mm/d
Assume the Depth of the Anaerobic pond is (Da) =		3.5	m
Providing, the mean Hydraulic retention time in the pond, $\Theta_a$ =		5.0	day
Now we know that,	$\Theta_a =$	$2 \cdot A_a \cdot D_a / (2 \cdot Q - 0.001 \cdot e \cdot A_a)$	
From the above equation we find the Anaerobic pond area will be (A <sub>a</sub> ) =		$2 \cdot Q \cdot \Theta_a / (2 \cdot D_a + 0.001 \cdot e \cdot \Theta_a)$	



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	=	2136	sq. M
So the Volume of the pond required, V=		7476	cub. M
We provided the volume of the first pond, V <sub>a</sub> =		7583	cub. M
First order rate constant, k <sub>1(T)</sub> =		k <sub>1(20)</sub> * 1.05 <sup>(T-20)</sup>	day <sup>-1</sup>
It has been experimentally proven that k <sub>1(20)</sub> is taken as 0.3 for first pond for its optimum operation.			
Now for 19°C, first order rate constant, k <sub>1(19)</sub> =		0.285	day <sup>-1</sup>
The effluent BOD will be according to temperature correlation =		Le = Li / (1 + k <sub>1</sub> * θ <sub>a</sub> )	for 19°C temp
	=	20.62	mg/l

**(b) Secondary Facultative Pond**

The effluent BOD (L<sub>e</sub>) from Anaerobic pond will become the influent of the Facultative pond. Which means, L<sub>i</sub> = 20.62 mg/l

Assume the net evaporation rate is (e) =		5	mm/d
Assume the Depth of the Facultative pond is (D <sub>f</sub> ) =		2	m
Providing, the mean Hydraulic retention time in the pond, θ <sub>f</sub> =		5.0	day
Now we know that,	θ <sub>f</sub> =	2 * A <sub>f</sub> * D <sub>f</sub> / (2 * Q - 0.001 * e * A <sub>f</sub> )	
From the above equation we find the Anaerobic pond area will be (A <sub>f</sub> ) =		2 * Q * θ <sub>f</sub> / (2 * D <sub>f</sub> + 0.001 * e * θ <sub>f</sub> )	
	=	3727	sq. M
So the Volume of the pond required, V=		7454	cub. M
We provided the volume of the first pond, V <sub>f</sub> =		7649	cub. M

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First order rate constant,  $k_{1(T)}$  =

It has been experimentally proven that  $k_{1(20)}$  is taken as 0.1 for second pond for its optimum operation.

Now for 19°C, first order rate constant,  $k_{1(19)}$  =

$$k_{1(20)} \cdot 1.05^{(T-20)}$$

day<sup>-1</sup>

$$0.095 \quad \text{day}^{-1}$$

The effluent BOD will be according to temperature correlation =

$$Le = Li / (1 + k_1 \cdot \Theta_T) \quad \text{for } ^\circ\text{C temp}$$

$$= 13.98 \quad \text{mg/l}$$

(e) Maturation Pond

The effluent BOD ( $Le$ ) from Anaerobic pond will become the influent of the Facultative pond. Which means,  $Li =$

13.98 mg/l

Assume the net evaporation rate is ( $e$ ) =

$$5 \quad \text{mm/d}$$

Assume the Depth of the Anaerobic pond is ( $D_a$ ) =

$$1.5 \quad \text{m}$$

Providing, the mean Hydraulic retention time in the pond,  $\Theta_m =$

$$2.0 \quad \text{day}$$

The area of the maturation pond will be ( $A_m$ ) =

$$2 \cdot Q \cdot \Theta_m / (2 \cdot D_m + 0.001 \cdot e \cdot \Theta_m)$$

$$= 1994 \quad \text{sq. M}$$

So the Volume of the pond required,  $V =$

$$2991 \quad \text{cub. M}$$

We provided the volume of the first pond,  $V_s =$

$$3748 \quad \text{cub. M}$$

It has been experimentally proven that  $k_{1(20)}$  is taken as 0.05 for maturation pond which ultimately gives 30% BOD reduction.

The effluent BOD will be according to temperature correlation =

$$Le = Li / (1 + k_1 \cdot \Theta_m) \quad \text{for } ^\circ\text{C temp}$$

$$= 9.79 \quad \text{mg/l}$$

(d) Sludge Accumulation



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Most of the sludge will accumulate in primary ponds. Assuming 0.5m deep allowable sludge deposition, capacity available for these ponds =  
 $0.5 \times 3^4$  Average pond area = 4000 m<sup>2</sup>

For 0.07 m<sup>3</sup>/person/year sludge accumulation rate as per CPHEEO manual,

So, Detention frequency = Sludge capacity / (population \* accumulation rate) = 16 years

Because of non-uniform deposition of sludge, a detouring frequency of once in 16 years is recommended

## 5.9 Environmental & Social Component

### 5.9.1 Environmental Sanitation and Management Plan (ESAMP)

The baseline situation is that the drains carry sewage to the Jheel thus adversely affecting its physical, chemical and biological parameters and adding, among other things, pathogens.

Thus drains carrying sewage potentially affect the aquatic animal and degradation of environment. It also makes fish grown in the water unfit for human consumption. The wastewater being discharged in to the Jheel through a drain makes for a very unpleasant site and thus affects aesthetics.

If the drains are intercepted and the water is treated in Sewage Treatment Plants to the desired standards before it is discharged into the river, the adverse impacts of these wastewaters on the jheel is eliminated and water becomes suitable for the uses corresponding to the water quality of the Jheel achieved as a result of implementation of the project of I&D and Treatment of the sewage carried in the drains.

The 2<sup>nd</sup> part of the Jheel having area near about 30000 Sq.m is being considered for converting into WSP by dividing into the 3 septic pond by constructing of embankment for i. Anaerobic pond. ii. Facultative pond. iii. maturation pond

Thus for construction of this embankment pond area will be reduced to 20000 Sq.m but on the other hand by this treatment the entire area of Santragachi jheel will be benefitted.

In addition to that we proposed plantation of this bank for improvement of environment mainly.

## 5.2 Communication & Public Outreach

Public Awareness & Public Participation should be a front-end activity of the project. The entire programme of conservation should be conceived, formulated, implemented, monitored and evaluated in close consultation with the stake holding communities following the approach of Participatory Appraisal.

The agency that will plan, implement and coordinate the awareness campaign should be identified. With a view to focus on issues relating to protection and improvement and cleaning of J, a massive program of environment education and awareness is imperative. Centre and states may launch this campaign through a program of volunteers called GREEN VOLUNTEERS.

### 5.9.2 Target Groups

- Local influential/Community leaders,
- Local NGOs,
- School teachers and students,
- Elite groups and organisations like Rotary Club, Lions club, Associations and forums of writers and artists, doctors, lawyers and other professional bodies etc.,
- Religious leaders and priests,



- Representatives of industry and commerce.

### 5.9.3 Action Points for Community Awareness

- Action is taken to get the Urban Local Body (ULB) to discuss the issue of river pollution – causes and effect and the need to take conservation measures.
- Request the ULB to set up a Committee on Awareness Generation and Public Participation for the entire city. Members of the Lok Sabha and the Vidhan Sabha may be coopted as special invitees. In turn, the Committee should invite civil society organisations in the city that are active to participate in the Awareness Generation and Public Participation Programme.
- With the involvement and help of the ULB, or otherwise, for each ward identify an active NGO or promote a group of interested and committed people to be involved in Ganga Pollution Abatement Project.
- The agency preparing the Pollution Abatement Project should prepare a plan of awareness generation and public participation and submit it to the Committee on Awareness Generation and Public Participation for approval. The plan could consider including the following activities, among others: -
  - Print and electronic media including the local newspapers should be invited and supported in covering the issue of pollution of rivers.
  - A website may be created to provide facts about the state of sanitation, in particular, the degradation of the river. It should be regularly updated.
  - Holding locality wise meetings and group discussions with influential people, whereby the extent of river pollution, the related physical and human factors, the consequent health hazards and the possible remedial measures are highlighted through talks and technical presentations by the experts and social workers (Action: Identified NGO of reputation).

### 5.9.4 Important Stages of Stakeholder Consultation Awareness Generation and Securing Public Participation

- Preparation of DPR
- Submission of the project
- Stage of sanction
- During implementation
- Any stage when obstacle if faced, say in identification of land needed for works.
- Implementation of DPR
- Commissioning and evaluation



### 5.9.5 Cost Estimate

A provision of the project cost may be made for generation of public awareness and securing public participation. Various items of cost for which provision should be made are illustrated below.

No.	Item	Basis of Calculation (Amount in lacs of Rs.)	Total Amount Rs. In Lacs
<b>A</b>			
Mass Media			
1	Advertisement of local Cable Network	3 Channels once a day for 6 months	₹ 20,000.00
2	Print Media publicity in local papers, magazines etc. Advertisement in the tourist guide books etc., Special features and commissioned articles	Once in three months for 2 years full page	₹ 20,000.00
3	Print material for Distribution including publicity on match boxes, stationary, stickers, etc.	10000 units of handbills 3 times a year for one year	₹ 20,000.00
4	Hoarding at strategic points in the city and on buses, rickshaws etc.	100 Sq. ft Hoarding at 1000m interval at Santragachi jheel periphery and One 200 Sq. ft Hoarding each at three strategic location for 2.5 years	₹ 1,10,000.00
<b>B</b>			
Plantation			
1	Cost of tree	250 no's of tree	₹ 1,00,000.00
2	Planting of tree 0.6m Dia hole, 1m dug in the ground, mixing soil in decay farmyard/sludge manure	200 no's	₹ 30,000.00
<b>C</b>			
Groups and Meetings			
1	Environmental Awareness at Schools Level (Talks, Essay, painting competitions, debates, other activities 5 per ward per year for 3 years)	6 Schools and 2 College event per year for 2 years	₹ 2,50,000.00
2	Other Awareness activities like public meetings, public debates, Meetings with different Unions, felicitation of best workers etc.	Lump Some	₹ 3,00,000.00
Total for Public Awareness and Public Participation Activities			₹ 8,50,000.00



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## 6 Abstract Cost Estimate

This cost is excluding the land cost of proposed sewage treatment plant. Total cost of the project is as follows:

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	AMOUNT	ANNEXURE List
<b>A. BASIC COST</b>					
1	Connecting Sewerage line from Diversion structure to new sewer line	305	Meter	₹ 1,309,508.16	ANNEXURE-1
2	Laying of new Sewerage line including 173 Manholes	3,400	Meter	₹ 35,722,611.55	ANNEXURE-2
3	Cost of 2 no. new Pumping station	2	Nos	₹ 37,366,333.03	ANNEXURE-3
4	Laying of new Rising Main Pipelines (250mm to 450 mm)	1,195	Meter	₹ 12,200,982.46	ANNEXURE-3
5	Cost of WSP including HDPE pipe arrangement	1	Nos	₹ 24,780,495.63	ANNEXURE-4
6	Cost of Land Preparation and Cofferdam (PS & WSP)	3	Nos	₹ 24,633,038.00	ANNEXURE-5
7	Cost of RCC Pipe carrying Chamber and Cross drainage Pipe	2	Nos	₹ 671,373.43	ANNEXURE-6
	Public toilet block	2	Nos	₹ 1,959,466.23	ANNEXURE-6
8	Jack pushing (600mm carrier pipe & 900 mm casin pipe)	38	Meter	₹ 3,800,000.00	ANNEXURE-8
<b>Sub Total (A)</b>				<b>₹ 142,443,808.49</b>	
<b>B. Utility Shifting cost</b>					
1	Cost to be incurred towards Utility Shifting @5% of Sub Total (A)			₹ 7,122,190.42	
<b>C. ESAMP Cost</b>					
1	ESMF & Communication (Including GST)			₹ 850,000.00	
D.	Procurement of Design and Drawing @ 1% of Sub Total (A)			₹ 1,424,438.08	
<b>TOTAL (A+B+C+E)</b>				<b>₹ 151,840,437.00</b>	
<b>E. Contingency charge</b>					
	Add Contingency @3% on Total (A+B+C+E)			₹ 4,555,213.11	
<b>F. Cess Charge</b>					

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ITEM NO.	DESCRIPTION	QUANTITY	UNIT	AMOUNT	ANNEXURE List
1	Add Cess @1% on Total A+B+C+E)			₹ 1,518,404.37	
<b>G.</b>	<b>Charges need to be paid to WBSEDCL</b>				ANNEXURE-8
	Fees to be paid to WBSEDCL for power connection charges to New proposed 1.45 MLD pump house including security			₹ 999,496.00	
	Fees to be paid to WBSEDCL for power connection charges to New proposed 7.5 MLD pump house including security			₹ 3,600,000.00	
	<b>Sub Total (G)</b>			<b>₹ 4,599,496.00</b>	
<b>H.</b>	<b>Capital cost</b>				
	<b>Sub Total (H)=(A+B+C+D+E+F+G)</b>			<b>₹ 162,513,550.48</b>	
<b>I.</b>	<b>Operation &amp; Maintenance (Including energy charge)</b>				
1	15 Years O&M Cost of Pipe Line			₹ 2,593,829.66	
2	15 Years O&M Cost of Pumping Stations including monthly electricity bill.			₹ 81,282,899.45	
3	15 Years O&M Cost of WSP			₹ 30,701,938.28	
	<b>Sub Total (I)</b>			<b>₹ 114,578,667.38</b>	
<b>J.</b>	<b>Contingency charge on O&amp;M</b>				
	Add Contingency @3% on Sub Total (I)			₹ 3,437,360.02	
<b>K.</b>	<b>Cess Charge on O&amp;M</b>				
	Add Cess @1% on Sub Total (I)			₹ 1,145,786.67	
<b>L.</b>	<b>TOTAL O&amp;M COST</b>				
	<b>Sub total (k)=(H+I+J)</b>			<b>₹ 119,161,814.08</b>	
	<b>TOTAL (G+K)</b>			<b>₹ 281,675,364.56</b>	
	<b>Grand Total (In Crores)</b>			<b>₹ 28.17</b>	

17/08/21  
Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

Sanjivita Das  
ENVIRONMENTAL ENGINEERING

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## 7 Detail Cost Estimate



# ANNEXURE -1

<b>A</b>	Cost of Diversion Pipeline- Santragachi Jheel Project	₹ 1,169,203.72	
<b>B</b>	Cost of Diversion Pipeline- Santragachi Jheel Project	₹ 1,309,508.16	<i>with 12% GST</i>



  
Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

Diversion Pipeline

879

Line	Start Node	End Node	Length	Sewage Flow, MLD	Peak Flow			Pipe Material	Manning's 'n'	Design Dia. (mm)	Gradients		R.L.		I.L.		Velocity, m/s	Discharge, lps	q/Q	d/D	v/V	Actual Velocity, m/s	Check
					MLD	m <sup>3</sup> /hr	lps				I in	Start	End	Start	End								
1	OF-1	MS-1	5	0.084	0.190	7.898	2.194	HDPE/UPVC	0.01	300	.325	0.003	99.825	99.825	98.925	98.910	0.986	69.723	0.031	0.145	0.018	0.610	Pipe Size Adequate
2	OF-2	MS-2	5	0.056	0.126	5.265	1.462	HDPE/UPVC	0.01	300	.325	0.003	99.778	99.778	99.28	99.265	0.986	69.723	0.021	0.137	0.012	0.604	Pipe Size Adequate
3	OF-3	MS-3	5	0.051	0.115	4.802	1.334	HDPE/UPVC	0.01	300	.325	0.003	99.615	99.615	99.115	99.100	0.986	69.723	0.019	0.135	0.011	0.603	Pipe Size Adequate
4	OF-4	MS-4	5	0.070	0.158	6.581	1.828	HDPE/UPVC	0.01	300	.325	0.003	99.9	99.9	99.4	99.385	0.986	69.723	0.026	0.141	0.015	0.607	Pipe Size Adequate
5	OF-5.1	MS-5	10	0.393	0.885	36.855	10.237	HDPE/UPVC	0.01	300	.325	0.003	100.05	100.05	99.65	99.619	0.986	69.723	0.147	0.232	0.082	0.671	Pipe Size Adequate
6	OF-5.2	MS-6	10	0.084	0.211	8.775	2.437	HDPE/UPVC	0.01	300	.325	0.003	99.715	99.715	99.465	99.434	0.986	69.723	0.035	0.147	0.020	0.612	Pipe Size Adequate
7	OF-5.3	MS-7	10	0.084	0.211	8.775	2.437	HDPE/UPVC	0.01	300	.325	0.003	99.659	99.659	99.359	99.328	0.986	69.723	0.035	0.147	0.020	0.612	Pipe Size Adequate
8	OF-6	MS-8	5	0.094	0.211	8.775	2.437	HDPE/UPVC	0.01	300	.325	0.003	99.105	99.105	98.705	98.690	0.986	69.723	0.035	0.147	0.020	0.612	Pipe Size Adequate
9	OF-7	MS-9	5	0.017	0.038	1.595	0.443	HDPE/UPVC	0.01	300	.300	0.003	99.187	99.187	98.887	98.870	1.027	72.570	0.006	0.126	0.004	0.620	Pipe Size Adequate
10	OF-8	MS-10	5	0.016	0.035	1.463	0.406	HDPE/UPVC	0.01	300	.300	0.003	99.217	99.217	98.917	98.900	1.027	72.570	0.006	0.125	0.004	0.620	Pipe Size Adequate
11	OF-9	MS-11	5	0.016	0.035	1.463	0.406	HDPE/UPVC	0.01	300	.300	0.003	99.167	99.167	98.867	98.850	1.027	72.570	0.006	0.125	0.004	0.620	Pipe Size Adequate
12	OF-10	MS-12	5	0.015	0.035	1.448	0.402	HDPE/UPVC	0.01	300	.300	0.003	99.197	99.197	98.897	98.880	1.027	72.570	0.006	0.125	0.004	0.620	Pipe Size Adequate
13	OF-11	MS-15	5	0.015	0.033	1.386	0.385	HDPE/UPVC	0.01	300	.300	0.003	99.137	99.137	98.837	98.820	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
14	OF-12	MS-14	5	0.012	0.028	1.161	0.323	HDPE/UPVC	0.01	300	.300	0.003	99.137	99.137	98.837	98.820	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
15	OF-13	MS-14	5	0.019	0.044	1.816	0.504	HDPE/UPVC	0.01	300	.300	0.003	99.137	99.137	98.837	98.820	1.027	72.570	0.007	0.126	0.004	0.621	Pipe Size Adequate
16	OF-14	MS-15	5	0.016	0.036	1.519	0.422	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.006	0.125	0.004	0.620	Pipe Size Adequate
17	OF-15	MS-15	5	0.015	0.034	1.423	0.395	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
18	OF-16	MS-16	5	0.014	0.032	1.350	0.375	HDPE/UPVC	0.01	300	.300	0.003	99.15	99.15	98.85	98.833	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
19	OF-17	MS-17	5	0.015	0.033	1.379	0.383	HDPE/UPVC	0.01	300	.300	0.003	99.175	99.175	98.875	98.858	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
20	OF-18	MS-17	5	0.012	0.028	1.170	0.325	HDPE/UPVC	0.01	300	.300	0.003	99.175	99.175	98.875	98.858	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
21	OF-19	MS-18	5	0.015	0.033	1.371	0.381	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
22	OF-20	MS-18	5	0.012	0.028	1.170	0.325	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
23	OF-21	MS-19	5	0.009	0.021	0.878	0.244	HDPE/UPVC	0.01	300	.300	0.003	99.1	99.1	98.8	98.783	1.027	72.570	0.003	0.124	0.003	0.619	Pipe Size Adequate
24	OF-22	MS-19	5	0.012	0.027	1.128	0.313	HDPE/UPVC	0.01	300	.300	0.003	99.1	99.1	98.8	98.783	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
25	OF-23	MS-20	5	0.013	0.029	1.215	0.337	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
26	OF-24	MS-20	5	0.010	0.023	0.963	0.268	HDPE/UPVC	0.01	300	.300	0.003	99.097	99.097	98.797	98.780	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
27	OF-25	MS-21	5	0.014	0.032	1.216	0.366	HDPE/UPVC	0.01	300	.300	0.003	99.197	99.197	98.897	98.880	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
28	OF-26	MS-21	5	0.011	0.024	0.987	0.274	HDPE/UPVC	0.01	300	.300	0.003	99.197	99.197	98.897	98.880	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
29	OF-27	MS-22	5	0.014	0.032	1.216	0.366	HDPE/UPVC	0.01	300	.300	0.003	99.172	99.172	98.872	98.855	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
30	OF-28	MS-23	5	0.025	0.056	2.317	0.643	HDPE/UPVC	0.01	300	.300	0.003	99.142	99.142	98.842	98.825	1.027	72.570	0.009	0.128	0.006	0.622	Pipe Size Adequate
31	OF-29	MS-24	5	0.023	0.051	2.145	0.596	HDPE/UPVC	0.01	300	.300	0.003	99.112	99.112	98.812	98.795	1.027	72.570	0.008	0.127	0.005	0.621	Pipe Size Adequate
32	OF-30	MS-25	5	0.015	0.033	1.386	0.385	HDPE/UPVC	0.01	300	.300	0.003	99.152	99.152	98.852	98.835	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
33	OF-31	MS-26	5	0.008	0.019	0.790	0.219	HDPE/UPVC	0.01	300	.300	0.003	99.106	99.106	98.806	98.789	1.027	72.570	0.003	0.123	0.002	0.618	Pipe Size Adequate
34	OF-32	MS-27	5	0.008	0.019	0.790	0.219	HDPE/UPVC	0.01	300	.300	0.003	99.154	99.154	98.854	98.837	1.027	72.570	0.003	0.123	0.002	0.618	Pipe Size Adequate
35	OF-33	MS-28	5	0.010	0.023	0.957	0.266	HDPE/UPVC	0.01	300	.300	0.003	99.134	99.134	98.834	98.817	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
36	OF-34	MS-29	5	0.008	0.017	0.718	0.199	HDPE/UPVC	0.01	300	.300	0.003	99.074	99.074	98.774	98.757	1.027	72.570	0.003	0.123	0.002	0.618	Pipe Size Adequate
37	OF-35	MS-30	5	0.015	0.034	1.410	0.392	HDPE/UPVC	0.01	300	.300	0.003	99.044	99.044	98.744	98.727	1.027	72.570	0.003	0.123	0.002	0.618	Pipe Size Adequate
38	OF-36	MS-31	5	0.016	0.036	1.504	0.418	HDPE/UPVC	0.01	300	.300	0.003	98.984	98.984	98.684	98.667	1.027	72.570	0.006	0.125	0.004	0.620	Pipe Size Adequate
39	OF-37	MS-31	5	0.011	0.024	1.013	0.281	HDPE/UPVC	0.01	300	.300	0.003	98.984	98.984	98.684	98.667	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
40	OF-38	MS-32	5	0.015	0.034	1.423	0.395	HDPE/UPVC	0.01	300	.300	0.003	99.004	99.004	98.704	98.687	1.027	72.570	0.005	0.125	0.004	0.620	Pipe Size Adequate
41	OF-39	MS-33	5	0.019	0.042	1.755	0.487	HDPE/UPVC	0.01	300	.300	0.003	99.336	99.336	99.336	99.319	1.027	72.570	0.007	0.126	0.004	0.620	Pipe Size Adequate
42	OF-40	MS-34	5	0.012	0.027	1.128	0.313	HDPE/UPVC	0.01	300	.300	0.003	99.276	99.276	98.976	98.959	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate
43	OF-41	MS-35	5	0.010	0.023	0.940	0.261	HDPE/UPVC	0.01	300	.300	0.003	99.202	99.202	98.902	98.885	1.027	72.570	0.004	0.124	0.003	0.619	Pipe Size Adequate





Node No	Length	Proposed Size			Excavation			Earthwork Excavation			Sand Filling	Single Layer BIS	Pipe								Brickwork	Plaster	IPS	New Content	Shoring			Earthwork Filling	Shuttering			Removal of Rubrah	Surface Dressing	Road Resurfacing
		Diameter Average	Depth	Depth	Width	0-1.5m	1.5-3.0m	3.0-4.5m	150	200			250	300	400	500	600	0-1.5m	1.5-3.0m	3.0-4.5m					Staging	Without Staging								
		(W)	(D)			Cum	Cum	Cum	Cum	Sq m			mm	mm	mm	mm	mm	mm	Cum	Sq m					Sq m	Sq m	Sq m		Sq m	Cum	Sq m			
OP-17	MS-17	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-18	MS-17	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-19	MS-18	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-20	MS-18	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-21	MS-17	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-22	MS-17	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-23	MS-21	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-24	MS-21	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-25	MS-21	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-26	MS-21	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-27	MS-22	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-28	MS-21	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-29	MS-24	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-30	MS-28	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-31	MS-26	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-32	MS-27	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-33	MS-28	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-34	MS-25	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-35	MS-30	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-36	MS-31	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-37	MS-32	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-38	MS-32	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-39	MS-34	4	0.500	0.500	0.408	0.645	1.31688	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	4.0833	0	0	0.1638	1.5	3.5	2	3.225	3.225
OP-40	MS-37	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-41	MS-36	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-42	MS-35	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225
OP-43	MS-35	4	0.500	0.500	0.708	0.645	2.28437	0	0	2.17272	3.25	0	0	0	5	0	0	0	0	0	0	0	0	0	0	7.0833	0	0	0.3494	1.5	3.5	2	3.225	3.225





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## Cost Estimate of Diversion Pipelines

## Santragachi Jheel

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD. <b>Bituminous course and Granular courses</b> by manual means	cum	59.017	₹ 625.00	₹ 36,885.94	Road and Bridge Works SOR 2018; Vol. III, P-235 item-2.14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq. m.	196.725	₹ 30.40	₹ 5,980.44	Road and Bridge Works SOR 2018; Vol. III, P-331; item no-18.02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL	%cum	160.000	₹ 11,927.00	₹ 19,083.20	Building Works SOR 2017; Vol I, p-1; Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL	%cum	0.000	₹ 19,238.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2b
	(ii) Depth of excavation below 3.0m GL	%cum	0.000	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2c
5	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m	sq. m.	490.000	₹ 386.00	₹ 189,140.00	Building Works SOR 2017; Vol I, pg-3 Item-6a
	(ii) Depth between 1.5m and 3.0m below GL	sq. m.	0.000	₹ 439.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6 b
	(iii) For basement work and Depth beyond 3.00 m.	sq. m.	0.000	₹ 498.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6c



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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
6	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A) Do - by fine sand</b>	%cum	182.700	₹ 95,183.00	₹ 173,899.34	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
7	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	122.000	₹ 166.00	₹ 20,252.00	Building Work SOR 2017 Vol-I, Page no. 12 item-13
8	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	200.000	₹ 357.00	₹ 71,400.00	Building Works SOR 2017; Vol I, page-14 Item-1 3rd Corrigenda & Addenda
9	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethylene Pipes conforming to IS 16098 (Part-II):2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 KN/Sqm. and Impact Resistance TIR value not more than 10% including necessary jointing materials for non-pressure underground Drainage, Sewerage & Cross drainage application.					
	(i)300m diameter (internal)	RM	305.000	₹ 1,349.00	₹ 411,445.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23; ITEM - 36
11	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	%cum	40.000	₹ 7,754.00	₹ 3,101.60	Building Works SOR 2017; Vol I, p-1; Item-3a
12	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					



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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	(i) For Construction of Sub Base by compacting 1st class brick aggregates (40 mm down) and sand (in proportion of 60:40).	Cu.M.	29.509	₹ 2,130.80	₹ 62,877.24	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
13	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorumscreening.	Cu.M.	14.754	₹ 2,748.09	₹ 40,546.28	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
14	Providing and applying primer coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 and requisite quantity on prepared surface of granular base including cleaning of road surface and spraying primer using Mechanical means including cost and carriage of bitumen emulsion and all other incidental costs of work complete as per Clause 502 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	(i) For WBM / WMM Surface: (with primer @ 0.70-1.0 kg/sqm)	Sq.M.	196.725	₹ 28.72	₹ 5,649.72	
15	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including					

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	196.725	₹ 9.31	₹ 1,830.64	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	196.725	₹ 10.11	₹ 1,988.12	
	[Ref: Detail Estimate vide Annexure-F]					Analysed rate
16	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	(1). For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	14.754	₹ 6,219.23	₹ 91,760.92	
	[Ref: Detail Estimate vide Annexure-G]					
17	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a					Analysed rate

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	196.725	₹ 129.21	₹ 25,419.01	
	[Ref: Detail Estimate vide Annexure-H]					
18	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	1 By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	196.725	₹ 40.38	₹ 7,944.27	
	[Ref: Detail Estimate vide Annexure-I]					
	Total				₹ 1,169,203.72	
	GST 12%				₹ 140,304.45	
	GRAND TOTAL				₹ 1,309,508.16	

*K.M.D.A.*  
Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.



# ANNEXURE -2

<b>A</b>	Cost of GM Pipeline -Bazar side quarter	₹ 7,732,555.48
<b>B</b>	Cost of GM Manhole -Bazar side quarter	₹ 2,773,949.17
<b>C</b>	Cost of GM Pipeline -Jheel side quarter	₹ 9,249,280.40
<b>D</b>	Cost of GM Manhole -Jheel side quarter	₹ 2,301,529.50
<b>E</b>	Cost of GM Pipeline -Resident area	₹ 7,933,270.13
<b>F</b>	Cost of GM Manhole -Resident area	₹ 1,904,604.19
		₹
	Total	31,895,188.88
		₹
	with 12% GST	35,722,611.55

  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.



DESIGN OF GRAVITY MAIN (Bazar side quarter)

Start Node	End Node	Length	Peak Flow		Pipe Material	Manning's 'n'	Design Dia (mm)	Gradient		R.L.		I.L.		Discharge, lps	Velocity, m/s	d/D	W/W	Actual Velocity, m/s	Check	
			MLD	Ips				I in		Start	End	Start	End							
OF-5.3	MS-7.1	20	0.211	2.437	HDPE/UPVC	0.01	300	1000	0.001	99.659	99.69	99.128	99.108	39.748	0.562	0.160	0.510	0.298	Pipe Size Adequate	
	MS-7.2	20	0.211	2.437	HDPE/UPVC	0.01	300	1000	0.001	99.69	99.7	99.108	99.088	39.748	0.562	0.160	0.510	0.298	Pipe Size Adequate	
	MS-7.3	20	0.211	2.437	HDPE/UPVC	0.01	300	1000	0.001	99.7	99.712	99.088	99.068	39.748	0.562	0.160	0.510	0.298	Pipe Size Adequate	
	MS-6	10	0.211	2.437	HDPE/UPVC	0.01	300	1000	0.001	99.712	99.715	99.068	99.058	39.748	0.562	0.160	0.510	0.298	Pipe Size Adequate	
	MS-6.1	15	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.715	99.72	99.058	99.043	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
	MS-6.2	15	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.72	99.965	99.043	98.728	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
OF-5.1	MS-6.3	15	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.965	99.675	98.728	98.513	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
	MS-6.4	20	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.675	99.525	98.513	98.493	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
	MS-6.5	20	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.525	99.445	98.493	98.473	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
	MS-5	10	0.421	4.875	HDPE/UPVC	0.01	300	1000	0.001	99.445	99.595	98.473	98.463	39.748	0.562	0.232	0.667	0.375	Pipe Size Adequate	
	MS-5.1	10	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.595	99.745	98.463	98.453	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.2	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.745	99.3	98.453	98.433	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
OF-4	MS-5.3	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.3	99.155	98.433	98.413	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.4	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.155	99.23	98.413	98.393	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.5	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.23	99.34	98.393	98.373	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.6	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.34	99.29	98.373	98.353	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.7	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.29	99.19	98.353	98.333	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.8	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.19	99.162	98.333	98.313	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
OF-3	MS-5.9	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.162	99.185	98.313	98.293	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.10	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.185	99.175	98.293	98.273	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-5.11	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.175	99.28	98.273	98.253	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-4	20	1.306	15.112	HDPE/UPVC	0.01	400	1000	0.001	99.28	99.325	98.253	98.233	85.603	0.681	0.177	0.282	0.747	0.509	Pipe Size Adequate
	MS-4.1	20	0.158	1.828	HDPE/UPVC	0.01	400	1000	0.001	99.325	99.388	98.233	98.213	85.603	0.681	0.221	0.402	0.274	Pipe Size Adequate	
	MS-4.2	20	0.158	1.828	HDPE/UPVC	0.01	400	1000	0.001	99.388	99.285	98.213	98.193	85.603	0.681	0.221	0.402	0.274	Pipe Size Adequate	
OF-2	MS-4.3	20	0.158	1.828	HDPE/UPVC	0.01	400	1000	0.001	99.285	99.245	98.193	98.173	85.603	0.681	0.221	0.402	0.274	Pipe Size Adequate	
	MS-4.4	20	0.158	1.828	HDPE/UPVC	0.01	400	1000	0.001	99.245	99.38	98.173	98.153	85.603	0.681	0.221	0.402	0.274	Pipe Size Adequate	
	MS-3	20	0.158	1.828	HDPE/UPVC	0.01	400	1000	0.001	99.38	99.38	98.153	98.133	85.603	0.681	0.221	0.402	0.274	Pipe Size Adequate	
	MS-3.1	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.38	99.485	98.133	98.113	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.2	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.485	99.425	98.113	98.093	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.3	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.425	99.485	98.093	98.073	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
OF-1	MS-3.4	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.485	99.555	98.073	98.053	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.5	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.555	99.58	98.053	98.033	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.6	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.58	99.605	98.033	98.013	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.7	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.605	99.628	98.013	97.993	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.8	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.628	99.65	97.993	97.973	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	
	MS-3.9	20	0.273	3.162	HDPE/UPVC	0.01	400	1000	0.001	99.65	99.678	97.973	97.953	85.603	0.681	0.337	0.452	0.308	Pipe Size Adequate	









**Cost of New Pipeline Laying in Santragachi Jheel Area (Bazar side quarter)**

**Santragachi Jheel, I&D D.P.R.**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials upto a lead of 100 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD <b>Bituminous courses and Granular courses</b> by manual means	cum	285.55	₹ 625.00	₹ 178,467.19	Road and Bridge Works SOR 2018, Vol III, P-235 item-2 14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq m	951.83	₹ 30.40	₹ 28,935.48	Road and Bridge Works SOR 2018, Vol III, P-331, item no-18 02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, hauling out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL.	%cum	1308.61	₹ 11,927.00	₹ 156,077.37	Building Works SOR 2017, Vol I, p-1, Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL.	%cum	571.19	₹ 19,238.00	₹ 109,886.14	Building Works SOR 2017, Vol I, p-1, Item-2b
	(iii) Depth of excavation below 3.0m GL.	%cum	18.83	₹ 23,470.00	₹ 4,419.71	Building Works SOR 2017, Vol I, p-1, Item-2 c
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured). (This item should be executed on specific direction of the Engineer in charge). (i) Up to 1.5 m	sq m	3254.12	₹ 386.00	₹ 1,256,088.98	Building Works SOR 2017, Vol I, Item-6a
	(ii) Depth between 1.5m and 3.0m below GL.	sq m	1322.76	₹ 439.00	₹ 580,690.96	Building Works SOR 2017, Vol I, Item-6 b
	(iii) For basement work and Depth beyond 3.00 m	sq m	42.80	₹ 498.00	₹ 21,313.63	Building Works SOR 2017, Vol I, Item-6c
5	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A) Do - by fine sand</b>	%cum	772.46	₹ 95,183.00	₹ 735,248.17	Building Works SOR 2017, Vol I, page-2 Item-4b 5th Corrigena & Addenda
6	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge.	cum	699.50	₹ 166.00	₹ 116,117.00	Building Work SOR 2017 Vol-I, Page no 12 item-13
7	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq m	960.50	₹ 357.00	₹ 342,898.50	Building Works SOR 2017, Vol I, page-14 Item-I 3rd Corrigena & Addenda
8	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethylene Pipes conforming to IS 16098 (Part-II) 2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 K.N./Sq.m. and Impact Resistance TIR value not more than 10% including necessary jointing materials for nonpressure underground Drainage, Sewerage & Cross drainage application.					
	300m diameter (internal)	RM	170.00	₹ 1,349.00	₹ 229,330.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23, ITEM - 36
	400m diameter (internal)	RM	610.00	₹ 1,950.00	₹ 1,189,500.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23, ITEM - 36
	500m diameter (internal)	RM	420.00	₹ 3,663.00	₹ 1,538,460.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23, ITEM - 36
12	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished	%cum	1206.03	₹ 7,754.00	₹ 9,357,555.00	Building Works SOR 2017, Vol I, p-1, Item-3a

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	quantity of work) with earth obtained from excavation of foundation					
13	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Construction of Sub Base by compacting 1st class brick aggregates (40 mm down) and sand (in proportion of 60:40)	Cu M	142.774	₹ 2,130.80	₹ 304,222.31	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
14	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening	Cu M	71.387	₹ 2,748.09	₹ 196,177.20	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
15	Providing and applying primer coat with Cationic Bitumen Emulsion of approved grade conforming to IS 8887-1978 and requisite quantity on prepared surface of granular base including cleaning of road surface and spraying primer using Mechanical means including cost and carriage of bitumen emulsion and all other incidental costs of work complete as per Clause 502 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					Analysed rate
	(i) For WBM / WMM Surface (with primer @ 0.70-1.0 kg/sqm)	Sq M	951.825	₹ 28.72	₹ 27,335.35	
16	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm)	Sq M	951.825	₹ 9.31	₹ 8,857.26	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm)	Sq M	951.825	₹ 10.11	₹ 9,619.25	Analysed rate
	[Ref: Detail Estimate vide Annexure-F]					
17	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the					

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(1) For Grading 2 (19 mm nominal size, 50-75 mm thick) [Ref: Detail Estimate vide Annexure-G]	Cu M	71 387	₹ 6,219 23	₹ 443,971 70	Analysed rate
18	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (at 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (at 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	Using Batch Type HMP of minimum capacity 100-120 TPH [Ref: Detail Estimate vide Annexure-H]	Sq M	951 825	₹ 129 21	₹ 122,986 12	Analysed rate
19	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> /100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	1 By Mechanical Means (1) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm) [Ref: Detail Estimate vide Annexure-I]	Sq M	951 825	₹ 40 38	₹ 38,437 20	Analysed rate
Total					₹ 7,732,555 48	
GST 12%					₹ 927,906 66	
GRAND TOTAL					₹ 8,660,462 14	

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**Bill of Quantity of Manholes of Santragachi Jheel (Bazar side quarter)**

Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

Node No		Length	Proposed Size		Excavation			number of manhole				Additional			shoring			Road Reference
From	To		Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m		
m	m	m	m	m	m	m	no	no	no	no	no	no	Sq m	Sq m	Sq m	Sq m		
MS-7	MS-7.1	20	0.3	1.1	0.792	2.400	1.200	1	0	0	0	0.000	0.000	7.505	0.000	0.000	2.88	
MS-7.1	MS-7.2	20	0.3	1.5	0.812	2.400	1.200	1	0	0	0	0.000	0.000	7.793	0.000	0.000	2.88	
MS-7.2	MS-7.3	20	0.3	1.5	0.844	2.400	1.200	1	0	0	0	0.000	0.000	8.082	0.000	0.000	2.88	
MS-7.3	MS-4	35	0.3	1.5	0.857	2.400	1.200	1	0	0	0	0.000	0.000	8.417	0.000	0.000	2.88	
MS-4	MS-6.1	15	0.3	1.5	0.877	2.400	1.200	1	0	0	0	0.000	0.000	8.417	0.000	0.000	2.88	



Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Address		shoring			Road Remarks	
From	To			Length	Width	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m		
															Sq. m	Sq. m	Sq. m		Sq. m
MS-0.1	MS-0.2	15	0.3	1.5	0.75	1.437	2.400	1.200	0	1	0	0	0	0.187	0.000	13.793	0.000	0.000	2.88
MS-0.2	MS-0.3	15	0.3	1.5	0.75	1.362	2.400	1.200	0	1	0	0	0	0.112	0.000	13.073	0.000	0.000	2.88
MS-0.3	MS-0.4	20	0.3	1.5	0.75	1.222	2.400	1.200	1	0	0	0	0	0.000	0.000	11.825	0.000	0.000	2.88
MS-0.4	MS-0.5	20	0.3	1.5	0.75	1.172	2.400	1.200	1	0	0	0	0	0.000	0.000	11.249	0.000	0.000	2.88
MS-0.5	MS-0.6	10	0.3	1.5	0.75	1.332	2.400	1.200	0	1	0	0	0	0.082	0.000	12.785	0.000	0.000	2.88
MS-0.6	MS-0.7	10	0.4	1.5	0.75	1.492	2.400	1.300	0	1	0	0	0	0.242	0.000	14.321	0.000	0.000	3.12
MS-0.7	MS-0.8	20	0.4	1.5	0.75	1.097	2.400	1.300	1	0	0	0	0	0.000	0.000	10.529	0.000	0.000	3.12
MS-0.8	MS-0.9	20	0.4	1.5	0.75	0.942	2.400	1.300	1	0	0	0	0	0.000	0.000	9.041	0.000	0.000	3.12
MS-0.9	MS-1.0	20	0.4	1.5	0.75	1.037	2.400	1.300	1	0	0	0	0	0.000	0.000	9.953	0.000	0.000	3.12
MS-1.0	MS-1.1	20	0.4	1.5	0.75	1.167	2.400	1.300	1	0	0	0	0	0.000	0.000	11.201	0.000	0.000	3.12
MS-1.1	MS-1.2	20	0.4	1.5	0.75	1.137	2.400	1.300	1	0	0	0	0	0.000	0.000	10.913	0.000	0.000	3.12
MS-1.2	MS-1.3	20	0.4	1.5	0.75	1.057	2.400	1.300	1	0	0	0	0	0.000	0.000	10.143	0.000	0.000	3.12
MS-1.3	MS-1.4	20	0.4	1.5	0.75	1.049	2.400	1.300	1	0	0	0	0	0.000	0.000	10.064	0.000	0.000	3.12
MS-1.4	MS-1.5	20	0.4	1.5	0.75	1.092	2.400	1.300	1	0	0	0	0	0.000	0.000	10.481	0.000	0.000	3.12
MS-1.5	MS-1.6	20	0.4	1.5	0.75	1.102	2.400	1.300	1	0	0	0	0	0.000	0.000	10.577	0.000	0.000	3.12
MS-1.6	MS-1.7	20	0.4	1.5	0.75	1.227	2.400	1.300	1	0	0	0	0	0.000	0.000	11.777	0.000	0.000	3.12
MS-1.7	MS-1.8	20	0.4	1.5	0.75	1.292	2.400	1.300	0	1	0	0	0	0.042	0.000	12.401	0.000	0.000	3.12
MS-1.8	MS-1.9	20	0.4	1.5	0.75	1.375	2.400	1.300	0	1	0	0	0	0.125	0.000	13.198	0.000	0.000	3.12
MS-1.9	MS-2.0	20	0.4	1.5	0.75	1.292	2.400	1.300	0	1	0	0	0	0.042	0.000	12.401	0.000	0.000	3.12
MS-2.0	MS-2.1	20	0.4	1.5	0.75	1.272	2.400	1.300	0	1	0	0	0	0.022	0.000	12.209	0.000	0.000	3.12
MS-2.1	MS-2.2	20	0.4	1.5	0.75	1.427	2.400	1.300	0	1	0	0	0	0.177	0.000	13.097	0.000	0.000	3.12
MS-2.2	MS-2.3	20	0.4	1.5	0.75	1.447	2.400	1.300	0	1	0	0	0	0.197	0.000	13.889	0.000	0.000	3.12
MS-2.3	MS-2.4	20	0.4	1.5	0.75	1.572	2.400	1.300	0	1	0	0	0	0.322	0.000	14.400	0.689	0.000	3.12
MS-2.4	MS-2.5	20	0.4	1.5	0.75	1.532	2.400	1.300	0	1	0	0	0	0.282	0.000	14.400	0.305	0.000	3.12
MS-2.5	MS-2.6	20	0.4	1.5	0.75	1.612	2.400	1.300	0	1	0	0	0	0.362	0.000	14.400	1.072	0.000	3.12
MS-2.6	MS-2.7	20	0.4	1.5	0.75	1.702	2.400	1.300	0	1	0	0	0	0.452	0.000	14.400	1.957	0.000	3.12
MS-2.7	MS-2.8	20	0.4	1.5	0.75	1.747	2.400	1.300	0	1	0	0	0	0.497	0.000	14.200	2.309	0.000	3.12
MS-2.8	MS-2.9	20	0.4	1.5	0.75	1.792	2.400	1.300	0	1	0	0	0	0.542	0.000	14.400	2.801	0.000	3.12
MS-2.9	MS-3.0	20	0.4	1.5	0.75	1.835	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	3.214	0.000	3.12
MS-3.0	MS-3.1	20	0.4	1.5	0.75	1.912	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	3.953	0.000	3.12
MS-3.1	MS-3.2	20	0.4	1.5	0.75	1.972	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	4.529	0.000	3.12
MS-3.2	MS-3.3	20	0.4	1.5	0.75	2.047	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	5.249	0.000	3.12
MS-3.3	MS-3.4	20	0.4	1.5	0.75	2.112	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	5.873	0.000	3.12
MS-3.4	MS-3.5	20	0.4	1.5	0.75	2.152	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	6.257	0.000	3.12
MS-3.5	MS-3.6	20	0.4	1.5	0.75	2.217	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	6.881	0.000	3.12
MS-3.6	MS-3.7	20	0.4	1.5	0.75	2.272	2.400	1.300	0	0	1	0	0	0.000	0.000	14.400	7.409	0.000	3.12
MS-3.7	MS-3.8	20	0.5	1.5	0.75	2.352	2.400	1.400	0	0	1	0	0	0.000	0.000	14.400	8.177	0.000	3.36
MS-3.8	MS-3.9	20	0.5	1.5	0.75	2.382	2.400	1.400	0	0	1	0	0	0.000	0.000	14.400	8.465	0.000	3.36
MS-3.9	MS-4.0	20	0.5	1.5	0.75	2.507	2.400	1.400	0	0	1	0	0	0.000	0.007	14.400	9.665	0.000	3.36
MS-4.0	MS-4.1	20	0.5	1.5	0.75	2.477	2.400	1.400	0	0	1	0	0	0.000	0.000	14.400	9.377	0.000	3.36
MS-4.1	MS-4.2	20	0.5	1.5	0.75	2.597	2.400	1.400	0	0	1	0	0	0.000	0.007	14.400	10.529	0.000	3.36
MS-4.2	MS-4.3	20	0.5	1.5	0.75	2.652	2.400	1.400	0	0	1	0	0	0.000	0.132	14.400	11.057	0.000	3.36
MS-4.3	MS-4.4	20	0.5	1.5	0.75	2.697	2.400	1.400	0	0	1	0	0	0.000	0.197	14.400	11.489	0.000	3.36

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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Final Measurement
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	1-1.5m	1.5-3.0m	3-4.5m	
		m	m	m	m	m	m	m	no	no	no	no			Sq m	Sq m	Sq m	Sq m
MS-1.09	MS-1.11	20	0.5	1.5	0.75	2.752	2.400	1.400	0	0	0	1	0.000	0.252	14.400	12.017	0.000	0.00
MS-1.11	MS-1.12	20	0.5	1.5	0.75	2.812	2.400	1.400	0	0	0	1	0.000	0.312	14.400	12.531	0.000	0.00
MS-1.12	MS-1.13	20	0.5	1.5	0.75	3.157	2.400	1.400	0	0	0	1	0.000	0.657	14.400	14.400	24.800	0.00
MS-1.13	MS-1.14	20	0.5	1.5	0.75	3.052	2.400	1.400	0	0	0	1	0.000	0.552	14.400	14.400	28.800	0.00
MS-1.14	MS-1.15	20	0.5	1.5	0.75	3.012	2.400	1.400	0	0	0	1	0.000	0.512	14.400	14.400	28.800	0.00
MS-1.15	MS-1.16	20	0.5	1.5	0.75	3.197	2.400	1.400	0	0	0	1	0.000	0.697	14.400	14.400	28.800	0.00
MS-1.16	MS-1.17	20	0.5	1.5	0.75	2.997	2.400	1.400	0	0	0	1	0.000	0.497	14.400	14.371	0.000	0.00
MS-1.17	MS-1.18	20	0.5	1.5	0.75	3.092	2.400	1.400	0	0	0	1	0.000	0.592	14.400	14.400	28.800	0.00
MS-1.18	MS-1.19	20	0.5	1.5	0.75	3.077	2.400	1.400	0	0	0	1	0.000	0.577	14.400	14.400	28.800	0.00
MS-1.19	MS-1.20	20	0.5	1.5	0.75	3.072	2.400	1.400	0	0	0	1	0.000	0.572	14.400	14.400	28.800	0.00
MS-1.20	MS-1.21	20	0.5	1.5	0.75	3.052	2.400	1.400	0	0	0	1	0.000	0.552	14.400	14.400	28.800	0.00
MS-1.21	MS-1.22	20	0.5	1.5	0.75	3.047	2.400	1.400	0	0	0	1	0.000	0.547	14.400	14.400	28.800	0.00
MS-1.22	Jackpith	20	0.5	1.5	0.75	3.043	2.400	1.400	0	0	0	1	0.000	0.543	14.400	14.400	28.800	0.00
Sub-TOTAL		1175		91.5	45.75	114.699	146.4	80.3	17	16	11	17	3.68131	7.71131	739.166	304.279	288	117.72

### Santragachi Jheel Manhole Cost Estimate

Sl No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
1	Construction of manhole with chamber of size as given below as per requirement without shaft with cement brick work (1:4) over 150mm thick jhama cement conc (1:4:8) bed over a layer of brick flat soling including providing 150mm thick R.C.C slab with ordinary cement concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick on edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm thick cement plastering (1:4) finished fine with neat cement 1.50 mm thick in the inside walls and invert, including supplying, fitting and fixing R.C.P.C manhole cover & frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) & C.I. steps (4kg. Each) including cutting hard crust, excavation, dewatering, back filling and removal of spoils but excluding shoring complete as per standard drawing (Depth of invert shall be between 1.25 m. and 1.80 m. below G.L.)					
	i) Average depth of invert 1.25 m. below G.L. with 250 mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	33	₹ 26,898.00	₹ 887,634.00	
	Addition to rate of manhole chamber without shaft as per above item for each addition in depth of 150 mm. or part thereof. With 250 mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	24.5	₹ 3,228.00	₹ 79,221.74	
2	Construction of manhole with chamber of size as given below as per requirement and 600mm x 600mm (inside measurement) square shaft, with cement brickwork (1:4) over 150 mm thick jhama cement concrete (1:4:8) bed, over a layer of brick flat soling including providing 150mm thick R.C.C slab with ordinary concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick-on-edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm thick cement plaster (1:4) finished fine with 1.5mm thick neat cement in the inside walls and invert including supplying, fitting and fixing R.C.P.C cover and frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) and C.I. steps (4 Kg. each) including cutting hard crust, excavation, de-watering removal of spoils but excluding shoring complete as per standard drawing					
	(Depth of invert shall not be less than 1.80M below G.L.) Average depth of invert 2.5m below G.L.					
	i) With 250mm thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	28	₹ 38,124.00	₹ 1,067,612.00	



Sl No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	(v) Addition or reduction to rate of manhole as per above item for each addition or reduction in depth of 150 mm or part thereof. With 375 mm thick brickwork (Depth of invert should not exceed 3.00M)					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	48 74	₹ 1,511.09	₹ 73,649.24	
3	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/ Jhau built piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth) to be measured (i) This item should be executed on specific direction of the Engineer in charge (ii) Up to 1.5 m	Sq m	789.17	₹ 386.00	₹ 304,617.99	Building Works SOR 2017, Vol 1, p-3
	(ii) 1.5 m to 3.0m	Sq m	304.28	₹ 439.00	₹ 133,578.33	
	(iii) above 3.0m	Sq m	-	₹ 498.00	₹ 0.00	
4	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40)	Cu M	28 908	₹ 2,130.80	₹ 61,597.17	Analysed rate
	[Ref. Detail Estimate vide Annexure-C]					
5	Water Bound Macadam Sub Base by consolidating Jhama metal, Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening	Cu M	14 454	₹ 2,748.09	₹ 39,720.82	Analysed rate
	[Ref. Detail Estimate vide Annexure-D]					
6	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq M	192 720	₹ 9.31	₹ 1,793.37	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq M	192 720	₹ 10.11	₹ 1,947.65	Analysed rate
	[Ref. Detail Estimate vide Annexure-F]					
7	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Grading 2 (19 mm nominal size, 50-75 mm thick)	Cu M	14 454	₹ 6,219.23	₹ 89,892.81	Analysed rate
	[Ref. Detail Estimate vide Annexure-G]					
8	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tapper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne					



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Sl No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	Using Hatch Type HMP of minimum capacity 100-120 TPH [Ref: Detail Estimate vide Annexure-II]	Sq M	192.720	₹ 129.21	₹ 24,901.52	Analysed rate
4	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> /100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100% passing through 2.50 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	By Mechanical Means (i) With Hot Bitumen Binder (@ 6.80 kg/10 sqm)	Sq M	192.720	₹ 40.38	₹ 7,782.54	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
Total						₹ 2,773,949.17

### DESIGN OF GRAVITY MAIN (Small Jheel Quarter)

  
**Executive Engineer**  
**WB-I/GAP/W&B Sector,**  
**K.M.D.A.**

	Start Node	End Node	Length	Peak Flow		Pipe Material	Manning's 'n'	Design Dia (mm)	Gradient		R.L.		I.L.		Velocity, m/s	Discharge, lps	Q/Q	d/D	v/V	Actual Velocity, m/s	Check
				MLD	lps				I in		Start	End	Start	End							
OF-11	MH-1	MH-1.1	20	0.066	0.766	HDPE/UPVC	0.01	250	1000	0.001	99.864	100.115	98.907	98.887	0.498	24.444	0.031	0.115	0.434	0.216	Pipe Size Adequate
	MH-1.1	MH-1.2	20	0.066	0.766	HDPE/UPVC	0.01	250	1000	0.001	100.115	100.145	98.887	98.867	0.498	24.444	0.031	0.115	0.434	0.216	Pipe Size Adequate
	MH-1.2	MH-1.3	20	0.066	0.766	HDPE/UPVC	0.01	250	1000	0.001	100.145	100.105	98.867	98.847	0.498	24.444	0.031	0.115	0.434	0.216	Pipe Size Adequate
	MH-1.3	MH-2	20	0.066	0.766	HDPE/UPVC	0.01	250	1000	0.001	100.105	100.042	98.847	98.827	0.498	24.444	0.031	0.115	0.434	0.216	Pipe Size Adequate
OF-54	MH-2	MH-2.1	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	100.042	99.992	98.827	98.807	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.1	MH-2.2	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.992	99.945	98.807	98.787	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.2	MH-2.3	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.945	99.825	98.787	98.767	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.3	MH-2.4	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.825	99.845	98.767	98.747	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.4	MH-2.5	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.845	99.802	98.747	98.727	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.5	MH-2.6	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.802	99.995	98.727	98.707	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
	MH-2.6	MH-3	20	0.134	1.552	HDPE/UPVC	0.01	300	1000	0.001	99.995	99.846	98.707	98.687	0.562	39.748	0.039	0.127	0.459	0.258	Pipe Size Adequate
OF-13	MH-3	MH-3.1	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.846	99.806	98.687	98.667	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.1	MH-3.2	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.806	99.785	98.667	98.647	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.2	MH-3.3	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.785	99.725	98.647	98.627	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.3	MH-3.4	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.725	99.745	98.627	98.607	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.4	MH-3.5	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.745	99.525	98.607	98.587	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.5	MH-3.6	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.525	99.502	98.587	98.567	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.6	MH-3.7	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.502	99.435	98.567	98.547	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.7	MH-3.8	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.435	99.486	98.547	98.527	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.8	MH-3.9	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.486	99.512	98.527	98.507	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate
	MH-3.9	MH-3.10	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.512	99.612	98.507	98.487	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate

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	Start Node	End Node	Length	Peak Flow		Pipe Material	Manning's n	Design Dia (mm)	Gradient		R.L.		I.L.		Velocity, m/s	Discharge, lps	q/Q	d/D	v/V	Actual Velocity, m/s	Check	
				MLD	lps				1 in		Start	End	Start	End								
	MB-3.10	MB-3.11	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.612	99.425	98.487	98.467	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate	
	MB-3.11	MB-3.12	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.425	99.408	98.467	98.447	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate	
	MB-3.12	MB-4	20	0.199	2.299	HDPE/UPVC	0.01	300	1000	0.001	99.408	99.606	98.447	98.427	0.562	39.748	0.058	0.155	0.519	0.292	Pipe Size Adequate	
OF-32	MB-3	MB-3.1	20	0.050	0.577	HDPE/UPVC	0.01	250	1000	0.001	100.026	100.084	99.329	99.309	0.498	24.444	0.024	0.104	0.409	0.204	Pipe Size Adequate	
	MB-3.1	MB-3.2	20	0.050	0.577	HDPE/UPVC	0.01	250	1000	0.001	100.084	100.036	99.309	99.289	0.498	24.444	0.024	0.104	0.409	0.204	Pipe Size Adequate	
	MB-3.2	MB-3.3	20	0.050	0.577	HDPE/UPVC	0.01	250	1000	0.001	100.036	99.916	99.289	99.269	0.498	24.444	0.024	0.104	0.409	0.204	Pipe Size Adequate	
	MB-3.3	MB-3.4	20	0.050	0.577	HDPE/UPVC	0.01	250	1000	0.001	99.916	99.826	99.269	99.249	0.498	24.444	0.024	0.104	0.409	0.204	Pipe Size Adequate	
	MB-3.4	MB-4	20	0.050	0.577	HDPE/UPVC	0.01	250	1000	0.001	99.826	99.606	99.249	99.229	0.498	24.444	0.024	0.104	0.409	0.204	Pipe Size Adequate	
	MB-4	MB-4.1	20	0.248	2.876	HDPE/UPVC	0.01	250	1000	0.001	99.606	99.643	98.427	98.407	0.498	24.444	0.118	0.227	0.659	0.328	Pipe Size Adequate	
	MB-4.1	MB-6	10	0.248	2.876	HDPE/UPVC	0.01	250	1000	0.001	99.643	99.55	98.407	98.397	0.498	24.444	0.118	0.227	0.659	0.328	Pipe Size Adequate	
OF-50.5	MB-7	MB-7.1	10	0.070	0.815	HDPE/UPVC	0.01	250	1000	0.001	99.724	99.655	99.067	99.057	0.498	24.444	0.033	0.118	0.544	0.271	Pipe Size Adequate	
	MB-7.1	MB-8	10	0.070	0.815	HDPE/UPVC	0.01	250	1000	0.001	99.655	99.576	99.057	99.047	0.498	24.444	0.033	0.118	0.440	0.219	Pipe Size Adequate	
OF-49	MB-8	MB-8.1	20	0.121	1.400	HDPE/UPVC	0.01	300	1000	0.001	99.576	99.416	99.047	99.027	0.562	39.748	0.035	0.121	0.446	0.251	Pipe Size Adequate	
	MB-8.1	MB-9	20	0.121	1.400	HDPE/UPVC	0.01	300	1000	0.001	99.416	99.386	99.027	99.007	0.562	39.748	0.035	0.121	0.446	0.251	Pipe Size Adequate	
OF-48	MB-9	MB-10	20	0.171	1.985	HDPE/UPVC	0.01	300	1000	0.001	99.386	99.356	99.007	98.987	0.562	39.748	0.050	0.143	0.493	0.277	Pipe Size Adequate	
OF-47	MB-10	MB-11	20	0.226	2.612	HDPE/UPVC	0.01	300	1000	0.001	99.356	99.354	98.987	98.967	0.562	39.748	0.066	0.167	0.544	0.306	Pipe Size Adequate	
OF-46	MB-11	MB-12	20	0.272	3.143	HDPE/UPVC	0.01	300	1000	0.001	99.354	99.336	98.967	98.947	0.562	39.748	0.079	0.187	0.587	0.330	Pipe Size Adequate	
OF-45	MB-12	MB-13	20	0.297	3.430	HDPE/UPVC	0.01	300	1000	0.001	99.336	99.386	98.947	98.927	0.562	39.748	0.086	0.198	0.610	0.343	Pipe Size Adequate	
OF-44	MB-13	MB-16	20	0.315	3.645	HDPE/UPVC	0.01	300	1000	0.001	99.386	99.55	98.927	98.907	0.562	39.748	0.092	0.203	0.621	0.349	Pipe Size Adequate	
A0	MB-16	MB-16.1	20	0.563	6.521	HDPE/UPVC	0.01	300	1000	0.001	99.55	99.422	98.907	98.887	0.562	39.748	0.164	0.270	0.728	0.410	Pipe Size Adequate	
	MB-16.1	MB-14	20	0.563	6.521	HDPE/UPVC	0.01	300	1000	0.001	99.422	99.181	98.887	98.867	0.562	39.748	0.164	0.270	0.728	0.410	Pipe Size Adequate	
OF-43	MB-14	MB-14.1	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.181	99.106	98.867	98.847	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.1	MB-14.2	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.106	99.097	98.847	98.827	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.2	MB-14.3	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.097	99.246	98.827	98.807	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.3	MB-14.4	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.246	99.222	98.807	98.787	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.4	MB-14.3	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.222	99.256	98.787	98.767	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.3	MB-14.6	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.256	99.186	98.767	98.747	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.6	MB-14.7	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.186	99.155	98.747	98.727	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.7	MB-14.8	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.155	99.21	98.727	98.707	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.8	MB-14.9	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.21	99.186	98.707	98.687	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.9	MB-14.10	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.186	99.066	98.687	98.667	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.10	MB-14.11	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.066	99.106	98.667	98.647	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	MB-14.11	MB-15	20	0.584	6.756	HDPE/UPVC	0.01	300	1000	0.001	99.106	99.156	98.647	98.627	0.562	39.748	0.170	0.276	0.737	0.415	Pipe Size Adequate	
	OF-42	MB-15	MB-16	20	0.609	7.054	HDPE/UPVC	0.01	300	1000	0.001	99.156	99.202	98.627	98.607	0.562	39.748	0.177	0.283	0.748	0.421	Pipe Size Adequate
	OF-41	MB-16	MB-17	20	0.632	7.315	HDPE/UPVC	0.01	300	1000	0.001	99.202	99.276	98.607	98.587	0.562	39.748	0.184	0.289	0.758	0.426	Pipe Size Adequate
	OF-40	MB-17	MB-18	20	0.659	7.629	HDPE/UPVC	0.01	300	1000	0.001	99.276	99.336	98.587	98.567	0.562	39.748	0.192	0.296	0.770	0.433	Pipe Size Adequate
	OF-39	MB-18	MB-18.1	20	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.336	99.426	98.567	98.547	0.562	39.748	0.204	0.306	0.783	0.440	Pipe Size Adequate
		MB-18.1	MB-18.2	20	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.426	99.376	98.547	98.527	0.562	39.748	0.204	0.306	0.783	0.440	Pipe Size Adequate
MB-18.2		MB-18.3	20	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.376	99.366	98.527	98.507	0.562	39.748	0.204	0.306	0.783	0.440	Pipe Size Adequate	
MB-18.3		MB-18.4	20	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.366	99.406	98.507	98.487	0.562	39.748	0.204	0.306	0.783	0.440	Pipe Size Adequate	
MB-18.4		MB-18.5	20	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.406	99.586	98.487	98.467	0.562	39.748	0.204	0.306	0.783	0.440	Pipe Size Adequate	



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Start Node	End Node	Length	Peak Flow		Pipe Material	Manning's 'n'	Design Dia. (mm)	Gradient		R.L.		I.L.		Velocity, m/s	Discharge, lps	q/Q	d/D	v/V	Actual Velocity, m/s	Check
			MLD	lps				I in		Start	End	Start	End							
MH-18.5	MH-18.6	15	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	99.586	100	98.467	98.452	0.562	39.748	0.204	0.306	0.781	0.440	Pipe Size Adequate
MH-18.6	LS	25	0.701	8.116	HDPE/UPVC	0.01	300	1000	0.001	100	100.2	98.452	98.427	0.562	39.748	0.204	0.306	0.781	0.440	Pipe Size Adequate

### Bill of Quantity OF SEWAGE LINE – SANTRAGACHI JHEEL

Node No	Length	Proposed Size		Excavation		Earthwork Excavation				Sand Filling 0.075m	Single Layer BFS	Pipe Length										Shoring			Earthwork Filling	Shuttering		Removal of Rubish	Road Restoration				
		Diameter (Depth) (W)	Depth(Width) (D)	Depth	Width	0-1.5 m	1.5-3.0 m	3.0-4.5 m	Cum			Cum	Cum	Cum	150 mm	200 mm	250 mm	300 mm	400 mm	500 mm	600 mm	800 mm	1000 mm	1200 mm		0-1.5m	1.5-3.0m			3.0-4.5m	Cum	Sq.m	Sq.m
From	To	m	m	m	m	m	m	Cum	Cum	Cum	Cum	Sq.m	m	m	m	m	m	m	m	m	m	m	Sq.m	Sq.m	Sq.m	Cum	Sq.m	Sq.m	Cum	Sq.m	Sq.m		
MH-1	MH-1.1	20	0.25	0.25	1.317	0.590	15.5425667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	0	0	0	0	0	52.6866667	0	0	9.05256667	10	5	6.5	60
MH-1.1	MH-1.2	20	0.25	0.25	1.478	0.590	17.4364667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	0	0	0	0	0	59.1066667	0	0	10.9464667	10	5	6.5	60
MH-1.2	MH-1.3	20	0.25	0.25	1.493	0.590	17.6134667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	0	0	0	0	0	59.7066667	0	0	11.1234667	10	5	6.5	60
MH-1.3	MH-2	20	0.25	0.25	1.461	0.590	17.2417667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	0	0	0	0	0	58.4466667	0	0	10.7517667	10	5	6.5	60
MH-2	MH-2.1	20	0.3	0.3	1.425	0.645	18.3782	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	56.9866667	0	0	10.6382	12	6	7.75	60
MH-2.1	MH-2.2	20	0.3	0.3	1.396	0.645	18.01055	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	55.8466667	0	0	10.27055	12	6	7.75	60
MH-2.2	MH-2.3	20	0.3	0.3	1.333	0.645	17.1914	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	53.3066667	0	0	9.4514	12	6	7.75	60
MH-2.3	MH-2.4	20	0.3	0.3	1.303	0.645	16.8044	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	52.1066667	0	0	9.0644	12	6	7.75	60
MH-2.4	MH-2.5	20	0.3	0.3	1.311	0.645	16.91405	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	52.4466667	0	0	9.17405	12	6	7.75	60
MH-2.5	MH-2.6	20	0.3	0.3	1.406	0.645	18.13955	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	56.2466667	0	0	10.39955	12	6	7.75	60
MH-2.6	MH-3	20	0.3	0.3	1.448	0.645	18.68135	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	57.9266667	0	0	10.94135	12	6	7.75	60
MH-3	MH-3.1	20	0.3	0.3	1.374	0.645	17.7203	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	54.9466667	0	0	9.9803	12	6	7.75	60
MH-3.1	MH-3.2	20	0.3	0.3	1.363	0.645	17.58485	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	54.5266667	0	0	9.84485	12	6	7.75	60
MH-3.2	MH-3.3	20	0.3	0.3	1.343	0.645	17.3204	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	53.7066667	0	0	9.5804	12	6	7.75	60
MH-3.3	MH-3.4	20	0.3	0.3	1.343	0.645	17.3204	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	53.7066667	0	0	9.5804	12	6	7.75	60
MH-3.4	MH-3.5	20	0.3	0.3	1.263	0.645	16.2884	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	50.5066667	0	0	8.5484	12	6	7.75	60
MH-3.5	MH-3.6	20	0.3	0.3	1.161	0.645	14.97905	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	46.4466667	0	0	7.23905	12	6	7.75	60
MH-3.6	MH-3.7	20	0.3	0.3	1.136	0.645	14.65655	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	45.4466667	0	0	6.91655	12	6	7.75	60
MH-3.7	MH-3.8	20	0.3	0.3	1.148	0.645	14.81135	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	0	0	0	0	0	45.9266667	0	0	7.07135	12	6	7.75	60



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Node No	From	To	Proposed Size		Excavation		Earthwork Excavation			Sand Filling 0.075m	Single Layer BFS	Pipe Length										Shoring			Earthwork Filling		Shuttering		Removal of Rebar	Road Reinforcement			
			Length	Diameter (Depth) (W)	Depth (D)	Depth	Width	0 - 1.5 m	1.5 - 3.0 m			3.0 - 4.5 m	150 mm	200 mm	250 mm	300 mm	400 mm	500 mm	600 mm	800 mm	1000 mm	1200 mm	0-1.5m	1.5-3.0m	3.0-4.5m	Cum	Sq m	Sq m			Sq m	Cum	Sq m
MH-18	MH-18	20	0.3	0.3	1.207	0.645	15.566	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	48.266667	0	0	7.826	12	6	7.75	60					
MH-19	MH-19	20	0.3	0.3	1.290	0.645	16.6167	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	51.586667	0	0	8.8967	12	6	7.75	60					
MH-10	MH-10	20	0.3	0.3	1.266	0.645	16.33355	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	50.646667	0	0	8.59355	12	6	7.75	60					
MH-11	MH-11	20	0.3	0.3	1.184	0.645	15.27575	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	47.366667	0	0	7.53575	12	6	7.75	60					
MH-12	MH-12	20	0.3	0.3	1.295	0.645	16.7012	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	51.786667	0	0	8.9612	12	6	7.75	60					
MH-5	MH-5	20	0.25	0.25	0.961	0.590	11.3358667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	38.426667	0	0	4.8458667	10	5	6.5	60					
MH-21	MH-21	20	0.25	0.25	0.986	0.590	11.6308667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	39.426667	0	0	5.1408667	10	5	6.5	60					
MH-52	MH-52	20	0.25	0.25	0.922	0.590	10.8756667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	36.866667	0	0	4.1856667	10	5	6.5	60					
MH-53	MH-53	20	0.25	0.25	0.837	0.590	9.8726667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	33.466667	0	0	3.3826667	10	5	6.5	60					
MH-54	MH-54	20	0.25	0.25	0.702	0.590	8.2796667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	28.066667	0	0	1.7896667	10	5	6.5	60					
MH-4	MH-4	20	0.25	0.25	1.432	0.590	16.8995667	0	0	12.4409	12	0	0	0	20	0	0	0	0	0	57.286667	0	0	10.4095667	10	5	6.5	60					
MH-7	MH-7	10	0.25	0.25	1.419	0.590	8.37308333	0	0	6.19594	6	0	0	0	10	0	0	0	0	0	28.383333	0	0	5.12808133	5	2.5	3.25	30					
MH-71	MH-71	10	0.25	0.25	0.852	0.590	5.02778333	0	0	6.19594	6	0	0	0	10	0	0	0	0	0	17.043333	0	0	1.78278133	5	2.5	3.25	30					
MH-73	MH-73	10	0.25	0.25	0.788	0.590	4.65018333	0	0	6.19594	6	0	0	0	10	0	0	0	0	0	15.763333	0	0	1.40518133	5	2.5	3.25	30					
MH-8	MH-8	20	0.3	0.3	0.684	0.645	8.8193	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	27.346667	0	0	1.0793	12	6	7.75	60					
MH-81	MH-81	20	0.3	0.3	0.609	0.645	7.8518	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	24.346667	0	0	0.1118	12	6	7.75	60					
MH-9	MH-9	20	0.3	0.3	0.619	0.645	7.9808	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	24.746667	0	0	0.2408	12	6	7.75	60					
MH-10	MH-10	20	0.3	0.3	0.623	0.645	8.0324	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	24.906667	0	0	0.2924	12	6	7.75	60					
MH-11	MH-11	20	0.3	0.3	0.613	0.645	7.9034	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	24.506667	0	0	0.1634	12	6	7.75	60					
MH-12	MH-12	20	0.3	0.3	0.649	0.645	8.3678	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	25.946667	0	0	0.6278	12	6	7.75	60					
MH-13	MH-13	20	0.3	0.3	0.776	0.645	10.0061	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	31.026667	0	0	2.2661	12	6	7.75	60					
MH-6	MH-6	20	0.3	0.3	0.814	0.645	10.4963	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	32.546667	0	0	2.7563	12	6	7.75	60					
MH-61	MH-61	20	0.3	0.3	0.649	0.645	8.37425	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	25.966667	0	0	0.63425	12	6	7.75	60					
MH-14	MH-14	20	0.3	0.3	0.511	0.645	6.59405	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	20.446667	0	0	-1.14595	12	6	7.75	60					

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Node No		Length	Proposed Size		Excavation		Earthwork Excavation			Sand Filling 0.075m	Single Layer BFS	Pipe Length												Shoring			Earthwork Filling		Shuttering		Removal of Rubish	Road Rehabilitation
From	To		Diameter (Depth)	Depth/Width	Depth	Width	0 - 1.5 m	1.5 - 3.0 m	3.0 - 4.5 m			150 mm	200 mm	250 mm	300 mm	400 mm	500 mm	600 mm	800 mm	1000 mm	1200 mm	0-1.5m	1.5-3.0m	3.0-4.5m	Earthwork Filling	Staging	Without Staging					
			(W)	(D)																								Cum	Cum	Cum		
MH-14.1	MH-14.2	20	0.3	0.3	0.489	0.645	6.31025	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	19.5066667	0	0	-1.42975	12	6	7.75	60				
MH-14.2	MH-14.3	20	0.3	0.3	0.570	0.645	7.47125	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	23.1666667	0	0	-0.26875	12	6	7.75	60				
MH-14.3	MH-14.4	20	0.3	0.3	0.662	0.645	8.5355	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	26.4666667	0	0	0.7955	12	6	7.75	60				
MH-14.4	MH-14.5	20	0.3	0.3	0.687	0.645	8.858	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	27.4666667	0	0	1.118	12	6	7.75	60				
MH-14.5	MH-14.6	20	0.3	0.3	0.689	0.645	8.8838	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	27.5466667	0	0	1.1438	12	6	7.75	60				
MH-14.6	MH-14.7	20	0.3	0.3	0.658	0.645	8.49035	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	26.3266667	0	0	0.75035	12	6	7.75	60				
MH-14.7	MH-14.8	20	0.3	0.3	0.690	0.645	8.90315	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	27.6066667	0	0	1.16315	12	6	7.75	60				
MH-14.8	MH-14.9	20	0.3	0.3	0.726	0.645	9.3611	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	29.0266667	0	0	1.6211	12	6	7.75	60				
MH-14.9	MH-14.10	20	0.3	0.3	0.674	0.645	8.6903	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	26.9466667	0	0	0.9503	12	6	7.75	60				
MH-14.10	MH-14.11	20	0.3	0.3	0.654	0.645	8.4323	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	26.1466667	0	0	0.6923	12	6	7.75	60				
MH-14.11	MH-14.12	20	0.3	0.3	0.719	0.645	9.2708	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	28.7466667	0	0	1.5308	12	6	7.75	60				
MH-14.12	MH-14.13	20	0.3	0.3	0.787	0.645	10.148	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	31.4666667	0	0	2.408	12	6	7.75	60				
MH-14.13	MH-14.14	20	0.3	0.3	0.867	0.645	11.18	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	34.6666667	0	0	3.44	12	6	7.75	60				
MH-14.14	MH-14.15	20	0.3	0.3	0.954	0.645	12.3023	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	38.1466667	0	0	4.5623	12	6	7.75	60				
MH-14.15	MH-14.16	20	0.3	0.3	1.049	0.645	13.5278	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	41.9466667	0	0	5.7878	12	6	7.75	60				
MH-14.16	MH-14.17	20	0.3	0.3	1.089	0.645	14.0438	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	43.5466667	0	0	6.3038	12	6	7.75	60				
MH-14.17	MH-14.18	20	0.3	0.3	1.079	0.645	13.9148	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	43.1466667	0	0	6.1748	12	6	7.75	60				
MH-14.18	MH-14.19	20	0.3	0.3	1.114	0.645	14.3663	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	44.5466667	0	0	6.6263	12	6	7.75	60				
MH-14.19	MH-14.20	20	0.3	0.3	1.244	0.645	16.0433	0	0	13.6552	13	0	0	0	20	0	0	0	0	0	49.7466667	0	0	8.3033	12	6	7.75	60				
MH-18.5	MH-18.6	15	0.3	0.3	1.558	0.645	14.5125	0.5627625	0	10.2202	9.75	0	0	0	15	0	0	0	0	0	45	1.745	0	9.2702625	9	4.5	6	45				
MH-18.6	LS	25	0.3	0.3	1.885	0.645	24.1875	6.2108125	0	17.0902	16.25	0	0	0	25	0	0	0	0	0	75	19.2583333	0	20.7233125	15	7.5	9.75	75				
TOTAL		1250	18.55	18.55	66.03367	40.565	811.95292	6.773575	0	839.41	801	0	0	230	1020	0	0	0	0	0	2562.4233	21.003333	0	349.35149	727	363.5	470.25	3750				

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## Cost of New Pipeline Laying in Santragachi Jheel Area (Small Jheel Quarter)

### Santragachi Jheel, I&D D.P.R.

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials upto a lead of 100 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD. <b>Bituminous courses and Granular courses</b> by manual means	cum	1125.00	₹ 625.00	₹ 703,125.00	Road and Bridge Works SOR 2018; Vol. III, P-235 item-2.14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq. m.	3750.00	₹ 30.40	₹ 114,000.00	Road and Bridge Works SOR 2018; Vol. III, P-331; item no-18.02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL	%cum	811.95	₹ 11,927.00	₹ 96,841.62	Building Works SOR 2017; Vol I, p-1; Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL	%cum	6.77	₹ 19,238.00	₹ 1,303.10	Building Works SOR 2017; Vol I, p-1, Item-2b
	(ii) Depth of excavation beLOW 3.0m GL	%cum	0.00	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2 c
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be	sq. m.	2562.42	₹ 386.00	₹ 989,095.41	Building Works SOR 2017; Vol I, Item-6a

h04



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m					
	(ii) Depth between 1.5m and 3.0m below GL	sq. m.	21.00	₹ 439.00	₹ 9,220.46	Building Works SOR 2017; Vol I, Item-6 b
	(iii) For basement work and Depth beyond 3.00 m.	sq. m.	0.00	₹ 498.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6c
5	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A) Do - by fine sand</b>	%cum	839.41	₹ 95,183.00	₹ 798,978.86	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
6	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound. in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	470.25	₹ 166.00	₹ 78,061.50	Building Work SOR 2017 Vol-I , Page no. 12 item-13
7	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	801.00	₹ 357.00	₹ 285,957.00	Building Works SOR 2017; Vol I, page-14 Item-1 3rd Corrigenda & Addenda
8	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethylene Pipes conforming to IS 16098 (Part-II):2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 KN/Sqm. and Impact Resistance TIR value not more than 10% including necessary jointing materials for non-pressure underground Drainage, Sewerage & Cross drainage application.					



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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	250m diameter (internal)	RM	230.00	₹ 1011.00	₹ 2,32,530.00	SANITARY AND PLUMBING SOR 2017, Vol-II, p-23, ITEM - 35
	300m diameter (internal)	RM	1020.00	₹ 1,349.00	₹ 1,375,980.00	SANITARY AND PLUMBING SOR 2017, Vol-II, p-23, ITEM - 36
12	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm, including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	%cum	349.35	₹ 7,754.00	₹ 27,088.71	Building Works SOR 2017, Vol I, p-1, Item-1a
13	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40)	Cu.M	562.500	₹ 2,130.80	₹ 1,198,575.00	Analysed rate
	[Ref. Detail Estimate vide Annexure-C]					
14	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite cherty or stone metal shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber.					



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	281.250	₹ 2,748.09	₹ 772,898.91	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
15	Providing and applying primer coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 and requisite quantity on prepared surface of granular base including cleaning of road surface and spraying primer using Mechanical means including cost and carriage of bitumen emulsion and all other incidental costs of work complete as per Clause 502 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	(i) For WBM / WMM Surface: (with primer @ 0.70-1.0 kg/sqm)	Sq.M.	3750.000	₹ 28.72	₹ 107,695.83	
16	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	3750.000	₹ 9.31	₹ 34,895.83	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion	Sq.M.	3750.000	₹ 10.11	₹ 37,897.91	Analysed rate

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	at the rate of 0.25 to 0.30 kg per sqm.)					
	[Ref: Detail Estimate vide Annexure-F]					
17	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(1). For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	281.250	₹ 6,219.23	₹ 1,749,159.65	Analysed rate
	[Ref: Detail Estimate vide Annexure-G]					
18	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m³ per m²) and 11.2 mm (@ 0.009 m³ per m²) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc.					

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	3750.000	₹ 129.21	₹ 484,540.71	Analysed rate
	[Ref: Detail Estimate vide Annexure-H]					
19	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	I By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	3750.000	₹ 40.38	₹ 151,434.89	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
	Total				₹ 9,249,280.40	

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**Executive Engineer**  
WB-I/GAP/W&B Sector,  
K.M.D.A.

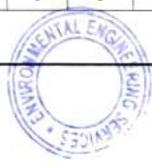
### Bill of Quantity of Manholes of Santragachi Jheel

Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m- 1.8m	1.8- 2.5m	2.5m- 3m	1.25m- 1.8m	2.5m- 3m	0-1.5m	1.5- 3.0m	3.0- 4.5m	



		m	m	m	m	m	m	m	no	no	no	no			Sq.m.	Sq.m.	Sq.m.	Sq.m.
MH-1	MH-1.1	20	0.25	1.5	0.75	1.503	2.400	1.150	0	1	0	0	0.253	0.000	14.400	0.026	0.000	2.76
MH-1.1	MH-1.2	20	0.25	1.5	0.75	1.553	2.400	1.150	0	1	0	0	0.303	0.000	14.400	0.506	0.000	2.76
MH-1.2	MH-1.3	20	0.25	1.5	0.75	1.533	2.400	1.150	0	1	0	0	0.283	0.000	14.400	0.314	0.000	2.76
MH-1.3	MH-2	20	0.25	1.5	0.75	1.490	2.400	1.150	0	1	0	0	0.240	0.000	14.301	0.000	0.000	2.76
MH-2	MH-2.1	20	0.3	1.5	0.75	1.460	2.400	1.200	0	1	0	0	0.210	0.000	14.013	0.000	0.000	2.88
MH-2.1	MH-2.2	20	0.3	1.5	0.75	1.433	2.400	1.200	0	1	0	0	0.183	0.000	13.754	0.000	0.000	2.88
MH-2.2	MH-2.3	20	0.3	1.5	0.75	1.333	2.400	1.200	0	1	0	0	0.083	0.000	12.794	0.000	0.000	2.88
MH-2.3	MH-2.4	20	0.3	1.5	0.75	1.373	2.400	1.200	0	1	0	0	0.123	0.000	13.178	0.000	0.000	2.88
MH-2.4	MH-2.5	20	0.3	1.5	0.75	1.350	2.400	1.200	0	1	0	0	0.100	0.000	12.957	0.000	0.000	2.88
MH-2.5	MH-2.6	20	0.3	1.5	0.75	1.563	2.400	1.200	0	1	0	0	0.313	0.000	14.400	0.602	0.000	2.88
MH-2.6	MH-3	20	0.3	1.5	0.75	1.434	2.400	1.200	0	1	0	0	0.184	0.000	13.763	0.000	0.000	2.88
MH-3	MH-3.1	20	0.3	1.5	0.75	1.414	2.400	1.200	0	1	0	0	0.164	0.000	13.571	0.000	0.000	2.88
MH-3.1	MH-3.2	20	0.3	1.5	0.75	1.413	2.400	1.200	0	1	0	0	0.163	0.000	13.562	0.000	0.000	2.88
MH-3.2	MH-3.3	20	0.3	1.5	0.75	1.373	2.400	1.200	0	1	0	0	0.123	0.000	13.178	0.000	0.000	2.88
MH-3.3	MH-3.4	20	0.3	1.5	0.75	1.413	2.400	1.200	0	1	0	0	0.163	0.000	13.562	0.000	0.000	2.88
MH-3.4	MH-3.5	20	0.3	1.5	0.75	1.213	2.400	1.200	1	0	0	0	0.000	0.000	11.642	0.000	0.000	2.88
MH-3.5	MH-3.6	20	0.3	1.5	0.75	1.210	2.400	1.200	1	0	0	0	0.000	0.000	11.613	0.000	0.000	2.88
MH-3.6	MH-3.7	20	0.3	1.5	0.75	1.163	2.400	1.200	1	0	0	0	0.000	0.000	11.162	0.000	0.000	2.88
MH-3.7	MH-3.8	20	0.3	1.5	0.75	1.234	2.400	1.200	1	0	0	0	0.000	0.000	11.843	0.000	0.000	2.88
MH-3.8	MH-3.9	20	0.3	1.5	0.75	1.280	2.400	1.200	0	1	0	0	0.030	0.000	12.285	0.000	0.000	2.88
MH-3.9	MH-3.10	20	0.3	1.5	0.75	1.400	2.400	1.200	0	1	0	0	0.150	0.000	13.437	0.000	0.000	2.88
MH-3.10	MH-3.11	20	0.3	1.5	0.75	1.233	2.400	1.200	1	0	0	0	0.000	0.000	11.834	0.000	0.000	2.88
MH-3.11	MH-3.12	20	0.3	1.5	0.75	1.236	2.400	1.200	1	0	0	0	0.000	0.000	11.862	0.000	0.000	2.88
MH-4	MH-4	20	0.3	1.5	0.75	1.454	2.400	1.200	0	1	0	0	0.204	0.000	13.955	0.000	0.000	2.88

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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no			Sq.m.	Sq.m.	Sq.m.	Sq.m.
3	12																	
MH-5	MH-5.1	20	0.25	1.5	0.75	1.050	2.400	1.150	1	0	0	0	0.000	0.000	10.077	0.000	0.000	2.76
MH-5.1	MH-5.2	20	0.25	1.5	0.75	1.022	2.400	1.150	1	0	0	0	0.000	0.000	9.808	0.000	0.000	2.76
MH-5.2	MH-5.3	20	0.25	1.5	0.75	0.922	2.400	1.150	1	0	0	0	0.000	0.000	8.848	0.000	0.000	2.76
MH-5.3	MH-5.4	20	0.25	1.5	0.75	0.852	2.400	1.150	1	0	0	0	0.000	0.000	8.176	0.000	0.000	2.76
MH-5.4	MH-4	20	0.25	1.5	0.75	0.652	2.400	1.150	1	0	0	0	0.000	0.000	6.256	0.000	0.000	2.76
MH-4	MH-4.1	20	0.25	1.5	0.75	1.511	2.400	1.150	0	1	0	0	0.261	0.000	14.400	0.102	0.000	2.76
MH-4.1	MH-6	10	0.25	1.5	0.75	1.428	2.400	1.150	0	1	0	0	0.178	0.000	13.706	0.000	0.000	2.76
MH-7	MH-7.1	10	0.25	1.5	0.75	0.873	2.400	1.150	1	0	0	0	0.000	0.000	8.378	0.000	0.000	2.76
MH-7.1	MH-8	10	0.25	1.5	0.75	0.804	2.400	1.150	1	0	0	0	0.000	0.000	7.715	0.000	0.000	2.76
MH-8	MH-8.1	20	0.3	1.5	0.75	0.664	2.400	1.200	1	0	0	0	0.000	0.000	6.371	0.000	0.000	2.88
MH-8.1	MH-9	20	0.3	1.5	0.75	0.654	2.400	1.200	1	0	0	0	0.000	0.000	6.275	0.000	0.000	2.88
MH-9	MH-10	20	0.3	1.5	0.75	0.684	2.400	1.200	1	0	0	0	0.000	0.000	6.563	0.000	0.000	2.88
MH-10	MH-11	20	0.3	1.5	0.75	0.662	2.400	1.200	1	0	0	0	0.000	0.000	6.352	0.000	0.000	2.88
MH-11	MH-12	20	0.3	1.5	0.75	0.664	2.400	1.200	1	0	0	0	0.000	0.000	6.371	0.000	0.000	2.88
MH-12	MH-13	20	0.3	1.5	0.75	0.734	2.400	1.200	1	0	0	0	0.000	0.000	7.043	0.000	0.000	2.88
MH-13	MH-6	20	0.3	1.5	0.75	0.918	2.400	1.200	1	0	0	0	0.000	0.000	8.810	0.000	0.000	2.88
MH-6	MH-6.1	20	0.3	1.5	0.75	0.810	2.400	1.200	1	0	0	0	0.000	0.000	7.773	0.000	0.000	2.88
MH-6.1	MH-14	20	0.3	1.5	0.75	0.589	2.400	1.200	1	0	0	0	0.000	0.000	5.651	0.000	0.000	2.88
MH-14	MH-14.1	20	0.3	1.5	0.75	0.534	2.400	1.200	1	0	0	0	0.000	0.000	5.123	0.000	0.000	2.88
MH-14.1	MH-14.2	20	0.3	1.5	0.75	0.545	2.400	1.200	1	0	0	0	0.000	0.000	5.229	0.000	0.000	2.88
MH-	MH-14.3	20	0.3	1.5	0.75	0.714	2.400	1.200	1	0	0	0	0.000	0.000	6.851	0.000	0.000	2.88

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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration	
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m		
		m	m	m	m	m	m	m	no	no	no	no			Sq.m.	Sq.m.	Sq.m.	Sq.m.	
14.2																			
MH-14.3	MH-14.4	20	0.3	1.5	0.75	0.710	2.400	1.200	1	0	0	0	0.000	0.000	6.813	0.000	0.000	2.88	
MH-14.4	MH-14.5	20	0.3	1.5	0.75	0.764	2.400	1.200	1	0	0	0	0.000	0.000	7.331	0.000	0.000	2.88	
MH-14.5	MH-14.6	20	0.3	1.5	0.75	0.714	2.400	1.200	1	0	0	0	0.000	0.000	6.851	0.000	0.000	2.88	
MH-14.6	MH-14.7	20	0.3	1.5	0.75	0.703	2.400	1.200	1	0	0	0	0.000	0.000	6.746	0.000	0.000	2.88	
MH-14.7	MH-14.8	20	0.3	1.5	0.75	0.778	2.400	1.200	1	0	0	0	0.000	0.000	7.466	0.000	0.000	2.88	
MH-14.8	MH-14.9	20	0.3	1.5	0.75	0.774	2.400	1.200	1	0	0	0	0.000	0.000	7.427	0.000	0.000	2.88	
MH-14.9	MH-14.10	20	0.3	1.5	0.75	0.674	2.400	1.200	1	0	0	0	0.000	0.000	6.467	0.000	0.000	2.88	
MH-14.10	MH-14.11	20	0.3	1.5	0.75	0.734	2.400	1.200	1	0	0	0	0.000	0.000	7.043	0.000	0.000	2.88	
MH-14.11	MH-15	20	0.3	1.5	0.75	0.804	2.400	1.200	1	0	0	0	0.000	0.000	7.715	0.000	0.000	2.88	
MH-15	MH-16	20	0.3	1.5	0.75	0.870	2.400	1.200	1	0	0	0	0.000	0.000	8.349	0.000	0.000	2.88	
MH-16	MH-17	20	0.3	1.5	0.75	0.964	2.400	1.200	1	0	0	0	0.000	0.000	9.251	0.000	0.000	2.88	
MH-17	MH-18	20	0.3	1.5	0.75	1.044	2.400	1.200	1	0	0	0	0.000	0.000	10.019	0.000	0.000	2.88	
MH-18	MH-18.1	20	0.3	1.5	0.75	1.154	2.400	1.200	1	0	0	0	0.000	0.000	11.075	0.000	0.000	2.88	
MH-18.1	MH-18.2	20	0.3	1.5	0.75	1.124	2.400	1.200	1	0	0	0	0.000	0.000	10.787	0.000	0.000	2.88	
MH-18.2	MH-18.3	20	0.3	1.5	0.75	1.134	2.400	1.200	1	0	0	0	0.000	0.000	10.883	0.000	0.000	2.88	

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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no			Sq.m.	Sq.m.	Sq.m.	Sq.m.
MH-18.3	MH-18.4	20	0.3	1.5	0.75	1.194	2.400	1.200	1	0	0	0	0.000	0.000	11.459	0.000	0.000	2.88
MH-18.4	MH-18.5	20	0.3	1.5	0.75	1.394	2.400	1.200	0	1	0	0	0.144	0.000	13.379	0.000	0.000	2.88
MH-18.5	MH-18.6	15	0.3	1.5	0.75	1.823	2.400	1.200	0	0	1	0	0.000	0.000	14.400	3.098	0.000	2.88
MH-18.6	LS	25	0.3	1.5	0.75	2.048	2.400	1.200	0	0	1	0	0.000	0.000	14.400	5.258	0.000	2.88
Sub-TOTAL		1250	18.55	96	48	69.7297	153.6	76.15	41	21	2	0	3.848	0	659.501	9.904	0	182.76

### Santragachi Jheel Manhole Cost estimate

Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
1	Construction of manhole with chamber of size as given below as per requirement without shaft with cement brick work (1:4) over 150mm. thick jhama cement conc. (1:4:8) bed over a layer of brick flat soling including providing 150mm. thick R.C.C. slab with ordinary cement concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick on edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm. thick cement plastering (1:4) finished fine with neat cement 1.50 mm. thick in the inside walls and invert, including supplying, fitting and fixing R.C.P.C. manhole cover & frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) & C.I. steps (4kg. Each) including cutting hard crust, excavation, dewatering, back filling and removal of spoils but excluding shoring complete as per standard drawing. (Depth of invert shall be between 1.25 m. and 1.80 m. below G.L.)					
	i) Average depth of invert 1.25 m. below G.L. with 250 mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm × 750mm)	Each	62	₹ 26,898.00	₹ 1,667,676.00	



Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	Addition to rate of manhole chamber without shaft as per above item for each addition in depth of 150 mm. or part thereof. With 250 mm. thick brick work.					
	a) 150 mm to 400 mm dia having internal size (1500mm × 750mm)	Each	25.7	₹ 3,228.00	₹ 82,808.96	
2	Construction of manhole with chamber of size as given below as per requirement and 600mm × 600mm. (inside measurement) square shaft, with cement brickwork (1:4) over 150 mm. thick jhama cement concrete (1:4:8) bed, over a layer of brick flat soling including providing 150mm. thick R.C.C. slab with ordinary concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick-on-edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm. thick cement plaster (1:4) finished fine with 1.5mm. thick neat cement in the inside walls and invert including supplying, fitting and fixing R.C.P.C. cover and frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) and C.I. steps (4 Kg. each) including cutting hard crust, excavation, de-watering removal of spoils but excluding shoring complete as per standard drawing.					
	(Depth of invert shall not be less than 1.80M below G.L.) Average depth of invert 2.5m. below G.L.					
	i) With 250mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm × 750mm)	Each	2	₹ 38,129.00	₹ 76,258.00	
	iv) Addition or reduction to rate of manhole as per above item for each addition or reduction in depth of 150 mm. or part thereof. With 375 mm. thick brickwork (Depth of invert should not exceed 3.00M.)					
	a) 150 mm to 400 mm dia having internal size (1500mm × 750mm)	Each	0.00	₹ 1,511.00	₹ 0.00	
3	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Engineer in charge). (i) Up to 1.5 m	Sq.m	659.50	₹ 386.00	₹ 254,567.31	Building Works SOR 2017, Vol I, p-3
	(ii) 1.5 m to 3.0m	Sq.m	9.90	₹ 439.00	₹ 4,347.86	
	(iii) above 3.0m	Sq.m	-	₹ 498.00	₹ 0.00	
4	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC. and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per					

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Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40).	Cu.M.	27.414	₹ 2,130.80	₹ 58,413.75	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
5	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	13.707	₹ 2,748.09	₹ 37,668.00	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
6	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	182.760	₹ 9.31	₹ 1,700.68	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	182.760	₹ 10.11	₹ 1,846.99	Analysed rate
	[Ref: Detail Estimate vide Annexure-F]					
7	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					



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Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	(1) For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	13.707	₹ 6,219.23	₹ 85,247.04	Analysed rate
	[Ref: Detail Estimate vide Annexure-G]					
8	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	182.760	₹ 129.21	₹ 23,614.58	Analysed rate
	[Ref: Detail Estimate vide Annexure-H]					
9	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> /100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	I By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	182.760	₹ 40.38	₹ 7,380.33	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
Total					₹ 2,301,529.50	

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Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

**DESIGN OF GRAVITY MAIN (Resident side)**

	Start Node	End Node	Length	Peak Flow		Pipe Material	Manning's n	Design Dia (mm)	Gradient		R.L.		I.L.		Velocity, m/s	Discharge, lps	q/Q	d/D	v/V	Actual Velocity, m/s	Check
				MLD	lps				I in		Start	End	Start	End							
OF-0	MS-8	MS-8.1	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.105	99.121	98.490	98.470	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.1	MS-8.2	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.121	99.195	98.470	98.450	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.2	MS-8.3	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.195	99.14	98.450	98.430	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.3	MS-8.4	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.14	99.14	98.430	98.410	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.4	MS-8.5	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.14	99.14	98.410	98.390	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.5	MS-8.6	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.14	99.158	98.390	98.370	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.6	MS-8.7	20	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.158	99.197	98.370	98.350	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
	MS-8.7	MS-9	10	0.211	2.437	HDPE/UPVC	0.01	400	1000	0.001	99.197	99.187	98.350	98.340	0.681	85.603	0.028	0.111	0.425	0.289	Pipe Size Adequate
OF-7	MS-9	MS-9.1	10	0.249	2.881	HDPE/UPVC	0.01	400	1000	0.001	99.187	99.197	98.340	98.330	0.681	85.603	0.034	0.119	0.441	0.301	Pipe Size Adequate
	MS-9.1	MS-9.2	20	0.249	2.881	HDPE/UPVC	0.01	400	1000	0.001	99.197	99.217	98.330	98.310	0.681	85.603	0.034	0.119	0.441	0.301	Pipe Size Adequate
	MS-9.2	MS-10	20	0.249	2.881	HDPE/UPVC	0.01	400	1000	0.001	99.217	99.217	98.310	98.290	0.681	85.603	0.034	0.119	0.441	0.301	Pipe Size Adequate
OF-8	MS-10	MS-10.1	20	0.284	3.287	HDPE/UPVC	0.01	400	1000	0.001	99.217	99.097	98.290	98.270	0.681	85.603	0.038	0.126	0.457	0.311	Pipe Size Adequate
	MS-10.1	MS-10.2	20	0.284	3.287	HDPE/UPVC	0.01	400	1000	0.001	99.097	99.117	98.270	98.250	0.681	85.603	0.038	0.126	0.457	0.311	Pipe Size Adequate
	MS-10.2	MS-11	20	0.284	3.287	HDPE/UPVC	0.01	400	1000	0.001	99.117	99.167	98.250	98.230	0.681	85.603	0.038	0.126	0.457	0.311	Pipe Size Adequate
OF-9	MS-11	MS-12	20	0.319	3.693	HDPE/UPVC	0.01	400	1000	0.001	99.167	99.197	98.230	98.210	0.681	85.603	0.043	0.133	0.472	0.321	Pipe Size Adequate
OF-10	MS-12	MS-13	20	0.354	4.095	HDPE/UPVC	0.01	400	1000	0.001	99.197	99.137	98.210	98.190	0.681	85.603	0.048	0.140	0.487	0.332	Pipe Size Adequate
OF-11	MS-13	MS-14	20	0.387	4.480	HDPE/UPVC	0.01	400	1000	0.001	99.137	99.137	98.190	98.170	0.681	85.603	0.052	0.147	0.501	0.341	Pipe Size Adequate
OF-12.15	MS-14	MS-15	20	0.459	5.307	HDPE/UPVC	0.01	400	1000	0.001	99.137	99.097	98.170	98.150	0.681	85.603	0.062	0.161	0.532	0.362	Pipe Size Adequate
OF-14.15	MS-15	MS-16	20	0.529	6.124	HDPE/UPVC	0.01	400	1000	0.001	99.097	99.15	98.150	98.130	0.681	85.603	0.072	0.175	0.562	0.383	Pipe Size Adequate
OF-16	MS-16	MS-17	19	0.562	6.498	HDPE/UPVC	0.01	400	1000	0.001	99.15	99.175	98.130	98.111	0.681	85.603	0.079	0.182	0.576	0.393	Pipe Size Adequate
OF-17.18	MS-17	MS-18	20	0.623	7.207	HDPE/UPVC	0.01	400	1000	0.001	99.175	99.097	98.111	98.091	0.681	85.603	0.084	0.194	0.603	0.411	Pipe Size Adequate
OF-19.20	MS-18	MS-19	20	0.684	7.913	HDPE/UPVC	0.01	400	1000	0.001	99.097	99.1	98.091	98.071	0.681	85.603	0.092	0.204	0.622	0.423	Pipe Size Adequate
OF-21.22	MS-19	MS-20	21	0.732	8.470	HDPE/UPVC	0.01	400	1000	0.001	99.1	99.097	98.071	98.050	0.681	85.603	0.099	0.210	0.631	0.430	Pipe Size Adequate
OF-23.24	MS-20	MS-21	20	0.784	9.075	HDPE/UPVC	0.01	400	1000	0.001	99.097	99.197	98.050	98.030	0.681	85.603	0.106	0.217	0.642	0.437	Pipe Size Adequate
OF-25.26	MS-21	MS-22	20	0.839	9.715	HDPE/UPVC	0.01	400	1000	0.001	99.197	99.172	98.030	98.010	0.681	85.603	0.113	0.224	0.653	0.445	Pipe Size Adequate
OF-27	MS-22	MS-23	20	0.871	10.081	HDPE/UPVC	0.01	400	1000	0.001	99.172	99.142	98.010	97.990	0.681	85.603	0.118	0.228	0.659	0.449	Pipe Size Adequate
OF-28	MS-23	MS-23.1	21	0.927	10.724	HDPE/UPVC	0.01	400	1000	0.001	99.142	99.182	97.990	97.969	0.681	85.603	0.125	0.235	0.671	0.457	Pipe Size Adequate
	MS-23.1	MS-24	20	0.927	10.724	HDPE/UPVC	0.01	400	1000	0.001	99.182	99.112	97.969	97.949	0.681	85.603	0.125	0.235	0.671	0.457	Pipe Size Adequate
OF-29	MS-24	MS-25	20	0.978	11.320	HDPE/UPVC	0.01	400	1000	0.001	99.112	99.152	97.949	97.929	0.681	85.603	0.132	0.241	0.681	0.464	Pipe Size Adequate
OF-30	MS-25	MS-26	20	1.011	11.705	HDPE/UPVC	0.01	400	1000	0.001	99.152	99.106	97.929	97.909	0.681	85.603	0.137	0.245	0.688	0.468	Pipe Size Adequate
OF-31	MS-26	MS-27	20	1.030	11.924	HDPE/UPVC	0.01	400	1000	0.001	99.106	99.154	97.909	97.889	0.681	85.603	0.139	0.247	0.691	0.471	Pipe Size Adequate
OF-32	MS-27	MS-28	20	1.049	12.144	HDPE/UPVC	0.01	400	1000	0.001	99.154	99.134	97.889	97.869	0.681	85.603	0.142	0.250	0.695	0.474	Pipe Size Adequate
OF-33	MS-28	MS-29	20	1.072	12.410	HDPE/UPVC	0.01	400	1000	0.001	99.134	99.074	97.869	97.849	0.681	85.603	0.145	0.253	0.700	0.477	Pipe Size Adequate
OF-34	MS-29	MS-30	20	1.089	12.669	HDPE/UPVC	0.01	400	1000	0.001	99.074	99.044	97.849	97.829	0.681	85.603	0.147	0.255	0.703	0.479	Pipe Size Adequate
OF-35	MS-30	MS-30.1	20	1.123	13.001	HDPE/UPVC	0.01	400	1000	0.001	99.044	99.084	97.829	97.809	0.681	85.603	0.152	0.259	0.710	0.484	Pipe Size Adequate
	MS-30.1	MS-31	20	1.123	13.001	HDPE/UPVC	0.01	400	1000	0.001	99.084	98.984	97.809	97.789	0.681	85.603	0.152	0.259	0.710	0.484	Pipe Size Adequate
OF-36.37	MS-31	MS-31.1	20	1.184	13.706	HDPE/UPVC	0.01	400	1000	0.001	98.984	99.089	97.789	97.769	0.681	85.603	0.160	0.267	0.722	0.492	Pipe Size Adequate
	MS-31.1	MS-32	20	1.184	13.706	HDPE/UPVC	0.01	400	1000	0.001	99.089	99.004	97.769	97.749	0.681	85.603	0.160	0.267	0.722	0.492	Pipe Size Adequate
OF-38	MS-32	MS-32.1	20	1.218	14.093	HDPE/UPVC	0.01	400	1000	0.001	99.004	98.904	97.749	97.729	0.681	85.603	0.163	0.271	0.729	0.497	Pipe Size Adequate



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Node No	Length	Proposed Size		Excavation		Earthwork Excavation			Sand Filling 0.075m	Single Layer BFS	Pipe Length												Shoring			Earthwork Filling	Shuttering		Removal of Rubble	Miscellaneous			
		From	To	Diameter (Depth) (W) (D)	Depth (m)	Width (m)	0-1.5m Cum	1.5-3.0m Cum			3.0-4.5m Cum	Pipe Length												0-1.5m Sq m	1.5-3.0m Sq m		3.0-4.5m Sq m	Sq m			Sq m	Sq m	
												150 mm	200 mm	250 mm	300 mm	400 mm	500 mm	600 mm	800 mm	1000 mm	1200 mm												
MS-22	MS-23	20	0.4	0.4	1.182	0.780	21.5632	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	55.2953846	0	0	11.6432	16	8	11	60
MS-23	MS-23.1	21	0.4	0.4	1.408	0.780	23.06115	0	0	12.903	16.5	0	0	0	0	21	0	0	0	0	0	0	0	0	0	59.1311538	0	0	11.59515	17	8.5	11.5	61
MS-23.1	MS-24	20	0.4	0.4	1.413	0.780	22.0488	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	56.5353846	0	0	11.1288	16	8	11	60
MS-24	MS-25	20	0.4	0.4	1.418	0.780	22.1268	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	56.7353846	0	0	11.2068	16	8	11	60
MS-25	MS-26	20	0.4	0.4	1.435	0.780	22.392	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	57.4153846	0	0	11.472	16	8	11	60
MS-26	MS-27	20	0.4	0.4	1.456	0.780	22.7196	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	58.2553846	0	0	11.7996	16	8	11	60
MS-27	MS-28	20	0.4	0.4	1.490	0.780	23.25	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	59.6153846	0	0	12.73	16	8	11	60
MS-28	MS-29	20	0.4	0.4	1.470	0.780	22.938	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	58.8153846	0	0	12.018	16	8	11	60
MS-29	MS-30	20	0.4	0.4	1.445	0.780	22.548	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	57.8153846	0	0	11.628	16	8	11	60
MS-30	MS-30.1	20	0.4	0.4	1.470	0.780	22.938	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	58.8153846	0	0	12.018	16	8	11	60
MS-30.1	MS-31	20	0.4	0.4	1.460	0.780	22.782	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	58.4153846	0	0	11.862	16	8	11	60
MS-31	MS-31.1	20	0.4	0.4	1.483	0.780	23.137	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	59.3153846	0	0	12.217	16	8	11	60
MS-31.1	MS-32	20	0.4	0.4	1.512	0.780	23.4	0.201	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	0.51538462	0	12.681	16	8	11	60	
MS-32	MS-32.1	20	0.4	0.4	1.480	0.780	22.47	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	57.6153846	0	0	11.35	16	8	11	60
MS-32.1	MS-32.2	20	0.4	0.4	1.405	0.780	21.924	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	56.2153846	0	0	11.004	16	8	11	60
MS-32.2	MS-32.3	20	0.4	0.4	1.415	0.780	22.08	0	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	0	56.6153846	0	0	11.16	16	8	11	60
MS-32.3	MS-32.4	20	0.4	0.4	1.565	0.780	23.4	1.02	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	2.61538462	0	13.5	16	8	11	60	
MS-32.4	MS-32.5	20	0.4	0.4	1.749	0.780	23.4	3.8826	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	9.65338462	0	16.3626	16	8	11	60	
MS-32.5	MS-32.6	20	0.4	0.4	1.830	0.780	23.4	5.1462	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	13.1953846	0	17.6262	16	8	11	60	
MS-32.6	MS-32.7	20	0.4	0.4	1.877	0.780	23.4	5.8872	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	15.6953846	0	18.3672	16	8	11	60	
MS-32.7	MS-32.8	20	0.4	0.4	1.951	0.780	23.4	7.0416	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	18.053846	0	19.5216	16	8	11	60	
MS-32.8	MS-32.9	20	0.4	0.4	2.066	0.780	23.4	8.8356	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	22.0553846	0	21.3156	16	8	11	60	
MS-32.9	Jackpunch	20	0.4	0.4	2.492	0.780	23.4	15.4812	0	12.279	15.75	0	0	0	0	20	0	0	0	0	0	0	0	0	60	39.053846	0	27.9612	16	8	11	60	
TOTAL		941	19.2	19.2	64.74346	37.44	946.76043	47.4954	0	577.54	741.25	0	0	0	0	941	0	0	0	0	0	0	0	0	2427.6678	121.78308	0	480.40983	751.5	376.8	517.5	2423	

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**Cost of New Pipeline Laying in Santragachi Jheel Area (Reident side)**

**Santragachi Jheel, I&D D.P.R.**

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials upto a lead of 100 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD. <b>Bituminous courses and Granular courses by manual means</b>	cum	846.90	₹ 625.00	₹ 529,312.50	Road and Bridge Works SOR 2018; Vol. III, P-235 item-2.14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq. m.	2823.00	₹ 30.40	₹ 85,819.20	Road and Bridge Works SOR 2018; Vol. III, P-331; item no-18.02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL	%cum	946.79	₹ 11,927.00	₹ 112,923.69	Building Works SOR 2017; Vol I, p-1; Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL	%cum	47.50	₹ 19,238.00	₹ 9,137.17	Building Works SOR 2017; Vol I, p-1, Item-2b
	(ii) Depth of excavation beLOW 3.0m GL	%cum	0.00	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2 c
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m	sq. m.	2427.67	₹ 386.00	₹ 937,079.76	Building Works SOR 2017; Vol I, Item-6a
	(ii) Depth between 1.5m and 3.0m below GL	sq. m.	121.78	₹ 439.00	₹ 53,462.77	Building Works SOR 2017; Vol I, Item-6 b

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	(iii) For basement work and Depth beyond 3.00 m.	sq. m.	0.00	₹ 498.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6c
5	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A) Do - by fine sand</b>	%cum	577.54	₹ 95,183.00	₹ 549,717.92	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
6	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	517.50	₹ 166.00	₹ 85,905.00	Building Works SOR 2017 Vol-I, Page no. 12 item-13
7	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	741.25	₹ 357.00	₹ 264,626.25	Building Works SOR 2017; Vol I, page-14 Item-1 3rd Corrigenda & Addenda
8	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethylene Pipes conforming to IS 16098 (Part-II):2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 KN/Sqm. and Impact Resistance TIR value not more than 10% including necessary jointing materials for nonpressure underground Drainage, Sewerage & Cross drainage application.					
	400m diameter (internal)	RM	950.00	₹ 1,950.00	₹ 1,852,500.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23; ITEM - 36
12	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	%cum	480.50	₹ 7,754.00	₹ 37,257.96	Building Works SOR 2017; Vol I, p-1; Item-3a
13	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting,					

521



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40).	Cu.M.	423.450	₹ 2,130.80	₹ 902,287.26	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
14	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	211.725	₹ 2,748.09	₹ 581,838.30	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
15	Providing and applying primer coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 and requisite quantity on prepared surface of granular base including cleaning of road surface and spraying primer using Mechanical means including cost and carriage of bitumen emulsion and all other incidental costs of work complete as per Clause 502 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	(i) For WBM / WMM Surface: (with primer @ 0.70-1.0 kg/sqm)	Sq.M.	2823.000	₹ 28.72	₹ 81,073.42	
16	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of					

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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	2823.000	₹ 9.31	₹ 26,269.58	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	2823.000	₹ 10.11	₹ 28,529.55	Analysed rate
	[Ref: Detail Estimate vide Annexure-F]					
17	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(1). For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	211.725	₹ 6,219.23	₹ 1,316,767.38	Analysed rate
	[Ref: Detail Estimate vide Annexure-G]					
18	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire					



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	2823.000	₹ 129.21	₹ 364,762.25	Analysed rate
	[Ref: Detail Estimate vide Annexure-H]					
19	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at a uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	I By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	2823.000	₹ 40.38	₹ 114,000.18	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
Total					₹ 7,933,270.13	

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### Bill of Quantity of Manholes of Santragachi Jheel

Executive Engineer  
WB-I/GAP/W&B Section  
K.M.D.A.

Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no	no	no	Sq.m.	Sq.m.	Sq.m.	Sq.m.
MS-8	MS-8.1	20	0.4	1.5	0.75	0.926	2.400	1.300	1	0	0	0	0.000	0.000	8.893	0.000	0.000	3.12



Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no	Sq.m.	Sq.m.	Sq.m.	Sq.m.		
MS-8.1	MS-8.2	20	0.4	1.5	0.75	1.020	2.400	1.300	1	0	0	0	0.000	0.000	9.796	0.000	0.000	3.12
MS-8.2	MS-8.3	20	0.4	1.5	0.75	0.985	2.400	1.300	1	0	0	0	0.000	0.000	9.460	0.000	0.000	3.12
MS-8.3	MS-8.4	20	0.4	1.5	0.75	1.005	2.400	1.300	1	0	0	0	0.000	0.000	9.652	0.000	0.000	3.12
MS-8.4	MS-8.5	20	0.4	1.5	0.75	1.025	2.400	1.300	1	0	0	0	0.000	0.000	9.844	0.000	0.000	3.12
MS-8.5	MS-8.6	20	0.4	1.5	0.75	1.063	2.400	1.300	1	0	0	0	0.000	0.000	10.208	0.000	0.000	3.12
MS-8.6	MS-8.7	20	0.4	1.5	0.75	1.122	2.400	1.300	1	0	0	0	0.000	0.000	10.775	0.000	0.000	3.12
MS-8.7	MS-9	10	0.4	1.5	0.75	1.122	2.400	1.300	1	0	0	0	0.000	0.000	10.775	0.000	0.000	3.12
MS-9	MS-9.1	10	0.4	1.5	0.75	1.142	2.400	1.300	1	0	0	0	0.000	0.000	10.967	0.000	0.000	3.12
MS-9.1	MS-9.2	20	0.4	1.5	0.75	1.182	2.400	1.300	1	0	0	0	0.000	0.000	11.351	0.000	0.000	3.12
MS-9.2	MS-10	20	0.4	1.5	0.75	1.202	2.400	1.300	1	0	0	0	0.000	0.000	11.543	0.000	0.000	3.12
MS-10	MS-10.1	20	0.4	1.5	0.75	1.102	2.400	1.300	1	0	0	0	0.000	0.000	10.583	0.000	0.000	3.12
MS-10.1	MS-10.2	20	0.4	1.5	0.75	1.142	2.400	1.300	1	0	0	0	0.000	0.000	10.967	0.000	0.000	3.12
MS-10.2	MS-11	20	0.4	1.5	0.75	1.212	2.400	1.300	1	0	0	0	0.000	0.000	11.639	0.000	0.000	3.12
MS-11	MS-12	20	0.4	1.5	0.75	1.262	2.400	1.300	0	1	0	0	0.012	0.000	12.119	0.000	0.000	3.12
MS-12	MS-13	20	0.4	1.5	0.75	1.222	2.400	1.300	1	0	0	0	0.000	0.000	11.735	0.000	0.000	3.12
MS-13	MS-14	20	0.4	1.5	0.75	1.242	2.400	1.300	1	0	0	0	0.000	0.000	11.927	0.000	0.000	3.12

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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no			Sq.m.	Sq.m.	Sq.m.	Sq.m.
MS-14	MS-15	20	0.4	1.5	0.75	1.222	2.400	1.300	1	0	0	0	0.000	0.000	11.735	0.000	0.000	3.12
MS-15	MS-16	20	0.4	1.5	0.75	1.295	2.400	1.300	0	1	0	0	0.045	0.000	12.436	0.000	0.000	3.12
MS-16	MS-17	19	0.4	1.5	0.75	1.339	2.400	1.300	0	1	0	0	0.089	0.000	12.858	0.000	0.000	3.12
MS-17	MS-18	20	0.4	1.5	0.75	1.281	2.400	1.300	0	1	0	0	0.031	0.000	12.301	0.000	0.000	3.12
MS-18	MS-19	20	0.4	1.5	0.75	1.304	2.400	1.300	0	1	0	0	0.054	0.000	12.522	0.000	0.000	3.12
MS-19	MS-20	21	0.4	1.5	0.75	1.322	2.400	1.300	0	1	0	0	0.072	0.000	12.695	0.000	0.000	3.12
MS-20	MS-21	20	0.4	1.5	0.75	1.442	2.400	1.300	0	1	0	0	0.192	0.000	13.847	0.000	0.000	3.12
MS-21	MS-22	20	0.4	1.5	0.75	1.437	2.400	1.300	0	1	0	0	0.187	0.000	13.799	0.000	0.000	3.12
MS-22	MS-23	20	0.4	1.5	0.75	1.427	2.400	1.300	0	1	0	0	0.177	0.000	13.703	0.000	0.000	3.12
MS-23	MS-23.1	21	0.4	1.5	0.75	1.488	2.400	1.300	0	1	0	0	0.238	0.000	14.288	0.000	0.000	3.12
MS-23.1	MS-24	20	0.4	1.5	0.75	1.438	2.400	1.300	0	1	0	0	0.188	0.000	13.808	0.000	0.000	3.12
MS-24	MS-25	20	0.4	1.5	0.75	1.498	2.400	1.300	0	1	0	0	0.248	0.000	14.384	0.000	0.000	3.12
MS-25	MS-26	20	0.4	1.5	0.75	1.472	2.400	1.300	0	1	0	0	0.222	0.000	14.135	0.000	0.000	3.12
MS-26	MS-27	20	0.4	1.5	0.75	1.540	2.400	1.300	0	1	0	0	0.290	0.000	14.400	0.388	0.000	3.12
MS-27	MS-28	20	0.4	1.5	0.75	1.540	2.400	1.300	0	1	0	0	0.290	0.000	14.400	0.388	0.000	3.12
MS-28	MS-29	20	0.4	1.5	0.75	1.500	2.400	1.300	0	1	0	0	0.250	0.000	14.400	0.004	0.000	3.12
MS-29	MS-30	20	0.4	1.5	0.75	1.490	2.400	1.300	0	1	0	0	0.240	0.000	14.308	0.000	0.000	3.12
MS-30	MS-30.1	20	0.4	1.5	0.75	1.550	2.400	1.300	0	1	0	0	0.300	0.000	14.400	0.484	0.000	3.12
MS-30.1	MS-31	20	0.4	1.5	0.75	1.470	2.400	1.300	0	1	0	0	0.220	0.000	14.116	0.000	0.000	3.12
MS-31	MS-31.1	20	0.4	1.5	0.75	1.595	2.400	1.300	0	1	0	0	0.345	0.000	14.400	0.916	0.000	3.12
MS-31.1	MS-32	20	0.4	1.5	0.75	1.530	2.400	1.300	0	1	0	0	0.280	0.000	14.400	0.292	0.000	3.12



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Node No		Length	dia of pipe	Proposed Size		Excavation			number of manhole				Addition		shoring			Road Restoration
From	To			Length (L)	Width (W)	Depth	length	Width	< 1.25m	1.25m-1.8m	1.8-2.5m	2.5m-3m	1.25m-1.8m	2.5m-3m	0-1.5m	1.5-3.0m	3.0-4.5m	
		m	m	m	m	m	m	m	no	no	no	no	Sq.m.	Sq.m.	Sq.m.	Sq.m.		
MS-32	MS-32.1	20	0.4	1.5	0.75	1.450	2.400	1.300	0	1	0	0	0.200	0.000	13.924	0.000	0.000	3.12
MS-32.1	MS-32.2	20	0.4	1.5	0.75	1.460	2.400	1.300	0	1	0	0	0.210	0.000	14.020	0.000	0.000	3.12
MS-32.2	MS-32.3	20	0.4	1.5	0.75	1.470	2.400	1.300	0	1	0	0	0.220	0.000	14.116	0.000	0.000	3.12
MS-32.3	MS-32.4	20	0.4	1.5	0.75	1.760	2.400	1.300	0	1	0	0	0.510	0.000	14.400	2.500	0.000	3.12
MS-32.4	MS-32.5	20	0.4	1.5	0.75	1.837	2.400	1.300	0	0	1	0	0.000	0.000	14.400	3.239	0.000	3.12
MS-32.5	MS-32.6	20	0.4	1.5	0.75	1.922	2.400	1.300	0	0	1	0	0.000	0.000	14.400	4.055	0.000	3.12
MS-32.6	MS-32.7	20	0.4	1.5	0.75	1.932	2.400	1.300	0	0	1	0	0.000	0.000	14.400	4.151	0.000	3.12
MS-32.7	MS-32.8	20	0.4	1.5	0.75	2.070	2.400	1.300	0	0	1	0	0.000	0.000	14.400	5.476	0.000	3.12
MS-32.8	MS-32.9	20	0.4	1.5	0.75	2.162	2.400	1.300	0	0	1	0	0.000	0.000	14.400	6.359	0.000	3.12
MS-32.9	Jackpush	20	0.4	1.5	0.75	2.922	2.400	1.300	0	0	0	1	0.000	0.422	14.400	13.655	0.000	3.12
Sub-TOTAL		941		72	36	68.1595	115.2	62.4	17	25	5	1	5.11962	0.42238	612.427	41.904	0	149.76

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### Santragachi Jheel Manhole Cost estimate

Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
1	Construction of manhole with chamber of size as given below as per requirement without shaft with cement brick work (1:4) over 150mm. thick jhama cement conc. (1:4:8) bed over a layer of brick flat soling including providing 150mm. thick R.C.C. slab with ordinary					



928

Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	cement concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick on edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm. thick cement plastering (1:4) finished fine with neat cement 1.50 mm. thick in the inside walls and invert, including supplying, fitting and fixing R.C.P.C. manhole cover & frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) & C.I. steps (4kg. Each) including cutting hard crust, excavation, dewatering, back filling and removal of spoils but excluding shoring complete as per standard drawing. (Depth of invert shall be between 1.25 m. and 1.80 m. below G.L.)					
	i) Average depth of invert 1.25 m. below G.L. with 250 mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	42	₹ 26,898.00	₹ 1,129,716.00	
	Addition to rate of manhole chamber without shaft as per above item for each addition in depth of 150 mm. or part thereof. With 250 mm. thick brick work.					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	34.1	₹ 3,228.00	₹ 110,174.12	
2	Construction of manhole with chamber of size as given below as per requirement and 600mm x 600mm. (inside measurement) square shaft, with cement brickwork (1:4) over 150 mm. thick jhama cement concrete (1:4:8) bed, over a layer of brick flat soling including providing 150mm. thick R.C.C. slab with ordinary concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick-on-edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm. thick cement plaster (1:4) finished fine with 1.5mm. thick neat cement in the inside walls and invert including supplying, fitting and fixing R.C.P.C. cover and frame (35 M.T. load bearing capacity) with ordinary cement concrete (mix 1:2:4) and C.I. steps (4 Kg. each) including cutting hard crust, excavation, de-watering removal of spoils but excluding shoring complete as per standard drawing.					
	(Depth of invert shall not be less than 1.80M below G.L.) Average depth of invert 2.5m. below G.L.					
	i) With 250mm. thick brick work					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	6	₹ 38,129.00	₹ 228,774.00	
	iv) Addition or reduction to rate of manhole as per above item for each addition or reduction in depth of 150 mm. or part thereof. With 375 mm. thick brickwork (Depth of invert should not exceed 3.00M.)					
	a) 150 mm to 400 mm dia having internal size (1500mm x 750mm)	Each	2.82	₹ 1,511.00	₹ 4,254.82	
3	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with	Sq.m	612.43	₹ 386.00	₹ 236,396.76	Building Works SOR 2017, Vol I, p-3



Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	supported earth is to be measured.) (This item should be executed on specific direction of the Engineer in charge). (i) Up to 1.5 m					
	(ii) 1.5 m to 3.0m	Sq.m	41.90	₹ 439.00	₹ 18,395.86	
	(iii) above 3.0m	Sq.m	-	₹ 498.00	₹ 0.00	
4	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40)	Cu.M.	22.464	₹ 2,130.80	₹ 47,866.29	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
5	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	11.232	₹ 2,748.09	₹ 30,866.49	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
6	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	149.760	₹ 9.31	₹ 1,393.60	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	149.760	₹ 10.11	₹ 1,513.49	Analysed rate

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Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	[Ref: Detail Estimate vide Annexure-F]					
7	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(1). For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	11.232	₹ 6,219.23	₹ 69,854.44	Analysed rate
	[Ref: Detail Estimate vide Annexure-G]					
8	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	149.760	₹ 129.21	₹ 19,350.62	Analysed rate
	[Ref: Detail Estimate vide Annexure-H]					
9	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					



Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	1 By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	149.760	₹ 40.38	₹ 6,047.70	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
	Total				₹ 1,904,604.19	

*[Signature]*  
**Executive Engineer**  
**WB-1/GAP/W&B Sector,**  
**K.M.D.A.**



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**Annexure-3**



# NEW LS-1.5 INLET

A	Cost of Wet Well	₹ 3,533,919.00
B	Cost of Pump house	₹ 823,257.81
C	Soil Test	₹ 60,440.00
D	Cost of Switch room	₹ 361,916.00
E	Cost of Boundary Wall	₹ 810,533.20
F	Cost of Storm water Drain	₹ 99,983.40
G	Cost of Approach road	₹ 173,559.00
H	Cost of Septic tank	₹ 92,204.71
I	Cost of Toilet	₹ 84,944.08
	TOTAL	₹ 6,040,757.20
	with 12% GST	₹ 6,765,648.07
J	Electro-Mech. Cost	₹ 8,047,951.05
	with 18% GST	₹ 9,496,582.24

  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.



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### NEW IS INLET -1.5 MLD

Flow	1.500	MLD
Screen Chamber Size	1.5 m Width X 0.7 m Length X 1 m Liquid Depth + 0.15 m Free Board	
Inlet Chamber Size	1 m Width X 1.5 m Length X 1 m Liquid Depth + 0.15 m Free Board	
Wet Well Size	4.2 m Well Diameter X 0.8 m Liquid Depth + 0.6 m Free Board	
Ground Level	101.196	m
Invert Level of Incoming Sewer	95.783	m
Invert Level of Wet Well	94.383	m
Sump Depth	6.9	m
Pump Type I	DWF/2	
Capacity	32.00	m <sup>3</sup> /hr
Head	8	m
Motor Capacity	2	HP
Pump Type II	DWF	
Capacity	63.00	m <sup>3</sup> /hr
Head	8	m
Motor Capacity	3	HP
Pump Type III	2.25 DWF	
Capacity	141.00	m <sup>3</sup> /hr
Head	8	m
Motor Capacity	7	HP
Capacity of DG	45	KVA
Capacity of Transformer	45	KVA
Power Requirement	10.20	KW
Civil Cost	₹ 5,678,840.60	
Electro-Mechanical Cost	₹ 8,662,472.00	



## Design of 1.5 MLD Pumping Station At Satragachi Jheel

Particulars	Value	Units		
Average Flow	1.7	MLD	LOCATION:	
	1700	m <sup>3</sup> /day	Average Flow, MLD	1.700
	70.833	m <sup>3</sup> /hr	Peak Flow, MLD	3.825
Peak Factor	2.25	-	Peak Flow, lps	44.271
Peak Flow	3.825	MLD	Peak Flow, m <sup>3</sup> /sec	0.044
	3825	m <sup>3</sup> /day	Pumping Main Length, m	150
	159.375	m <sup>3</sup> /hr	Static Head, m	7.313
	2.656	m <sup>3</sup> /min	Design Period, Year	15
	0.044	m <sup>3</sup> /sec	Combined Pump Efficiency	75%
	44.271	lps	Pumping Hour	24
Invert Level of Incoming Sewer	97.433	m		
Ground Level	101.196	m	Modified Hazen William's Formula	$V = 143.534 C_R r^{(0.6575)} S^{(0.5525)}$ $h = [L(Q/C_R)^{1.81}] / [994.62 D^{4.81}]$
Finished Floor Level	101.696	m		
<b>INLET CHAMBER</b>			Pump Capacity, m <sup>3</sup> /hr	70.83
Hydraulic Retention Time, HRT	0.5	min	Pipe Diameter, mm	250
Volume of Chamber	1.328	m <sup>3</sup>	Hydraulic Mean Depth, m	0.0625
Liquid Depth	1.000	m	Area, m <sup>2</sup>	0.049
Area	1.328	m <sup>2</sup>	Pipe Loss, m	0.42
Width	1.0	m	Pipe Material	CI / DI - Unlined
Length	1.4	m		
Free Board	0.35	m	Cr Value	1
Size Provided	1 m X 1.5 m X 1 m LD +0.35 m FB		Slope, 1 in	0.00280
<b>SCREEN CHAMBER</b>			Slope	357.00
Velocity through Screen at Avg Flow	0.6	m/sec	Velocity, m/sec	0.902
Velocity through Screen at Peak Flow	1.0	m/sec	Entry & Exit Loss, m	0.041
Calculated Clear Area of openings at Average Flow	0.033	m <sup>2</sup>	HEAD LOSS, m	0.462



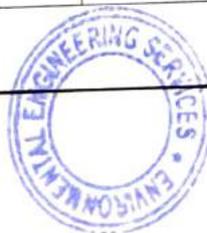
Calculated Clear Area of openings at Peak Flow	0.044	m <sup>2</sup>	5% Margin for Frictional Loss	0.023		
Provided Area	0.044	m <sup>2</sup>	FITTING LOSSES	K-Value	No. of Items	Total Losses
Water Depth	1.000	m	Sudden Contraction	0.5	1	0.5
Calculated Clear Width of Openings through Rack	0.044	m	Entrance Shape Well Rounded	0.5	0	0
Spacing between Bars	10	mm	Elbow 90 Degrees	1	1	1
Number of Spacings	5.000	Nos	Elbow 45 Degrees	0.75	0	0
Number of Bars	4.000	Nos	Elbow 22 Degrees	0.5	0	0
Bar Size	8	mm	Tee 90 Degrees	1.5	0	0
Total Width of Screen Chamber Required	0.082	m	Tee in Straight Pipe	0.3	0	0
Provided Screen Width	0.282	m	Gate Valve Open	0.4	1	0.4
Actual Velocity through Screen at Average Flow	0.444	m/sec	Valve with Reducer and Increaser	0.5	0	0
Actual Velocity through Screen at Peak Flow	1.0	m/sec	Globe Valve	10	0	0
Approach Velocity at Average Flow	0.070	m/sec	Angle	5	0	0
Approach Velocity at Peak Flow	0.157	m/sec	Swing Check	2.5	0	0
Free Board	0.35	m	Venturi Meter	0.3	0	0
Headloss through Screen, $h = 0.0729 X (V^2 - v^2)$ ; Where V = Velocity through screen at peak flow, v = Approach Velocity at Peak Flow			Orifice	1	0	0
Headloss through Clear Screen	71.1	mm				
Headloss through 50% clogged Screen	289.8	mm	HEAD LOSS from Fitting, m	0.079		
Screen Chamber Length	1.475	m				
Screen Chamber Width	0.7	m	Center of Pipe at Discharge Point, m	101.696		
Screen Chamber Liquid Depth	1	m	I.L. at Suction Sump, m	94.383		
Screen Chamber Free Board	0.350	m				
Bar Inclination	70.00	Degree				
SIZE PROVIDED	1.5 m X 0.7 m X 1 m LD +0.35 m FB		Calculated Head, m	7.877		



WET WELL			Total Head Provided - m	8.000	
Hydraulic Retention Time, HRT	15	min			
Volume	9.961	m <sup>3</sup>			
Liquid Depth	2	m			
Area	4.980	m <sup>2</sup>			
Diameter Required	2.519	m			
Diameter Provided	2.6	m			
Free Board	1.0	m			
SIZE Required	2.6 m Diameter X 2 m LD + 1 m FB				
Assumption, Pumps are placed at both side of the intermediate passage of Wet Well. Now as per Pump arrangements the Diameter will be :			Greater value has been taken as Actual Dia of Wetwell. Hence, Liquid Depth and Free Board will be;		
Pump width	500	mm	Actual Dia provided	4.2	m
Center to Center distance	600	mm	Area	13.850	m <sup>2</sup>
No of Pumps	5	nos	Liquid Depth (Actual)	0.8	m
Diameter of wet well	4.2	m	Free Board (Actual)	0.6	m
Actual SIZE PROVIDED	4.2 m Diameter X 0.8 m LD + 0.6 m FB				

### Bill of Quantity for Civil Estimation of 1.5 MLD Pump House

Parameters			Unit	Quantity			
				Wet Well	Inlet Chamber	Screen Chamber	TOTAL
Proposed Size	Length	(L)	m	4.200	1.5	1.5	7.200
	Depth	(D)	m	1.400	1.35	1.35	4.100
	Width	(B)	m	4.200	1	0.7	5.900
	Floor Slab Thickness	(Tf)	m	0.500	0.25	0.25	1.000
	Roof Slab Thickness	(Tr)	m	0.000	0	0	0.000
	Wall Thickness	(Tw)	m	0.500	0.25	0.25	1.000
Ground Level			m	101.196	101.196	101.196	303.588
IL of incoming Sewer			m	95.783	97.433	97.133	290.349
Invert Level			m	94.383	96.083	95.783	286.249
Excavation	Depth		m	9.263	5.613	5.913	21.000
	Width		m	6.350	2.500	2.200	12.000



	Length		m	6.350	3.000	3.000	13.000
Earthwork Excavation	0-1.5m		Cum	60.484	11.250	9.900	82.000
	1.5-3.0m		Cum	60.484	11.250	9.900	82.000
	3.0-4.5m		Cum	252.540	19.597	19.226	292.000
Sand Filling		0.075m	Cum	3.024	0.563	0.495	5.000
Single Layer BFS			Sq. m.	40.500	7.500	6.500	55.000
PCC		100mm	Cum	4.032	0.750	0.660	6.000
							0.000
RCC	Bottom Slab	500mm	Cum	42.493	0.375	0.2625	44.000
	intermediate slab	300mm		25.496	0	0	26.000
	Top Slab	300mm		25.496	0	0	26.000
	Bottom Plugging	1350m m		114.732	0	0	115.000
	Wall	500mm	Cum	50.321	4.05	4.80654	60.000
Brickwork			Cum	0.000	0	0	0.000
Plaster			Sq. m.	0.000	8	7.04	16.000
DPC			Sq. m.	0.000	1.8	1.26	4.000
Flooring			Sq. m.	0.000	0	0	0.000
Neat Cement			Sq. m.	0.000	8	7.04	16.000
Shoring	0-1.5m		Sq. m.	76.200	16.500	15.600	109.000
	1.5-3.0m		Sq. m.	76.200	16.500	15.600	109.000
	3.0-4.5m		Sq. m.	0.000	28.743	30.295	60.000
Earthwork Filling			Cum	166.605	38.197	35.966	241.000
Reinforcement			MT	5.171	0.089	0.101	6.000
Shuttering	Staging		Sq. m.	244.750	13.500	12.000	271.000
	Without Staging		Sq. m.	77.750	2.250	1.500	82.000
Cutting Edge			MT	2.500	0.000	0.000	2.500
bored cast-in-situ pile 10m (450mm)			m	0.000	60.000		60.000
pile cap			Cum	0.000	0.900		0.900



pile reinforcement		MT	0.000	1.050		1.050	
Removal of Rubish		Cum	207.000	4.000	3.250	215.000	
Proposed Stair Size	Length	(L)	m	6.813	3.8	3.8	
	Spacing		m	0.3	0.3	0.3	
	anchor length@0.6m		m	2.4	2.4	2.4	
	steps@0.3m	(S)	no	23.0	13.0	13.0	
	Width	(B)	m	0.6	0.6	0.6	
	Steel Density		kg/m <sup>3</sup>	7850	7850	7850	
	width of bar	b	m <sup>2</sup>	0.1	0.1	0.1	
	thickness of bar	t	m	0.035	0.035	0.035	
	weight	W	MT	0.7562768 5	0.4533375	0.4533375	1.66295185



### 1.5 MLD Pump Wet Well Cost

Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SRB Reference
1	Surface Dressing	Surface Dressing of the ground in any kind of soil including removing vegetation inequalities not exceeding 15 cm depth and disposal of the rubbish within a lead upto 75 m as directed.	Sq.m	42.48	₹ 10.00	₹ 424.80	Bidding Work SRB 2017-18 Page no. 100
2	Excavation	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or m. as directed. The item includes necessary trimming stacking the spoils within a lead of 75 the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. Depth of excavation not exceeding 1,500 mm.	%cum	82.00	₹ 11,927.00	₹ 9,780.00	Bidding Work SRB 2017-18 Page no. 100
		b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm. but not requiring shoring.	%cum	82.00	₹ 19,258.00	₹ 15,774.00	
		c) Depth of excavation for additional depth beyond 3000 mm. upto 4000mm. excluding cost of shoring as necessary.	%cum	292.00	₹ 23,470.00	₹ 68,572.00	
3	Shoring	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m	Sq.m	109.00	₹ 386.00	₹ 42,074.00	Bidding Work SRB 2017-18 Page no. 100
		(b) For additional depth beyond 1.5 m. and upto 3.00 m	Sq.m	109.00	₹ 439.00	₹ 47,881.00	
		c) For additional depth beyond 3.00 m.	Sq.m	241.00	₹ 498.00	₹ 120,118.00	
4	Filling	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) (a) With earth obtained from excavation of foundation.	%Cum	241.00	₹ 7,754.00	₹ 18,687.00	Bidding Work SRB 2017-18 Page no. 100
5	Removal of Rubbish	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	215.00	₹ 166.00	₹ 35,690.00	Bidding Work SRB 2017-18 Page no. 12
6	Sand Filling	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand (payment to be made on measurement of finished quantity). 150 mm layer (B) Do by fine sand	%cum	5.00	₹ 95,183.00	₹ 4,759.15	Bidding Work SRB page 2 47-48 CURRUGEN/1/A



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Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
							ADDENDA
7	BFS	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	sqm	55.00	₹ 357.00	₹ 19,635.00	PWD SOR Vol-1 Page no. 14 item - 1. 3rd Corrigenda
8	Shuttering & Centering	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor) 25mm to 30mm thick wooden shuttering as per decision and Direction of engg in charge	sqm	271.00	₹ 334.00	₹ 90,514.00	PWD SOR Vol-1 Page no. 42-43 item-76 (a,f)
		i) 25 mm to 30 mm shuttering without staging in foundation	sqm	82.00	₹ 209.00	₹ 17,138.00	
9	PCC	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. Pakur Variety	cum	6.00	₹ 5,506.62	₹ 33,039.75	Building Work SOR 2017 Vol-1 Rate Analysis
10	RCC	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation. i) With approved concrete pump.	cum	156.90	₹ 7,575.51	₹ 1,188,597.99	Building Work SOR Vol-1, Rate Analysis
11	Reinforcement	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation, basement and upto roof of ground floor/upto 4 m Tor steel/Mild Steel SAIL/ TATA/RINL	MT	7.05	₹ 60,443.00	₹ 426,123.15	Building Work SOR 2017, P-44, Item 40 (a), (b), (d) CORRIGENDA
12	Plastering	Plastering Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary	sqm	16.00	₹ 185.00	₹ 2,960.00	Building Work SOR 2017 Vol-1, Page no. 189, item-



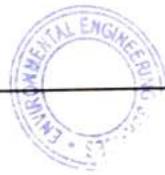
Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SGR Reference
		(Ground floor) [Excluding cost of chipping over concrete surface] 20 mm thick plaster with 1:4 cement mortar					
13	Punning	Neat cement punning about 1.5mm thick in wall, dado, window sill, floor etc. Cement 0.152 cu.m per100 sq.m.	sqm	16.00	₹ 34.00	₹ 544.00	Building Work SGR 2017 Volume Page No. 192, Item 11
14	DPC	25 mm. thick damp proof with cement concrete (1:1.5:3) (with graded stone aggregate 10 mm. normal size) and painting the top surface with a coat of bitumen [VG.40] using 1.7 kg. per sq.m. including heating the bitumen and cost and carriage of all materials complete. [Bitumen to be supplied by the Agency]	Sqm	4.00	₹ 263.00	₹ 1,052.00	Building Work SGR 2017 Volume Page No. 47, Item 102, Compounds
15	MS Structural Work	M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)-1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816-1969 & IS: 1995 using electrodes of approved make and brand conforming to IS:814-2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental charges such as electricity charges, labour insurance charges etc.					Building Work SGR 2017 Volume Page No. 102, Item 102, Compounds
		III) For built up sections / structural members of specified sections weighing not less than 22.5 Kg./m					
		a. Fabrication, Erecting and laying steel cutting edge for well kerb.	MT	2.50	₹ 75,266.00	₹ 1,88,165.00	
		b. stair	MT	1.66	₹ 75,266.00	₹ 1,24,941.70	
16	RC Concreting	RCC: Supplying ready mixed concrete of M 25 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. In bottom plug	Cum	115.00	₹ 7,419.41	₹ 853,231.95	Building Work SGR 2017 Volume PART- ANA, SSSD
17	Pile for Inlet and grit	Providing Bored Cast-in-situ _____ grade R.C.C. pile in position as per specifications in all kinds of soil including cost of boring using drilling	RM	60	₹ 1,636.00	₹ 98,160.00	Building Work SGR 2017 Volume



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Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	chamber	mud to stabilize the bore and flushing the bore of excess mud with freshly prepared drilling fluid by using pumps prior to placing concrete by tremie pipe in one continuous operation and including the cost of all materials and labour for placing of concrete and also including the cost of mobilization and hire charges of all equipment necessary for boring, welding of reinforcement cage as necessary and lowering of reinforcement cage, preparation and placing of concrete, including the cost of concrete but excluding the cost of reinforcement and labour for bending binding etc. complete as per Drawing and Technical Specifications and removal of excavated earth with all lifts and lead upto 1000 m. Work to be executed as per IS: 2911 (Part II Sec 2).iv) Pile diameter - 600 mm.					Page no. 36 item-24
17	Well Sinking	Sinking of Well as per IRC specification through all types of strata namely sandy soil, clayey soil and rock as shown against each case, including drawing Foundation Wells true to position and plumb with dia under cutting edge as mentioned below, including hire charges of all tools and plants etc. and supplying power, dewatering etc. initial excavation of earth complete as per drawing and technical specifications and direction of the Engineer-in-charge including throwing the spoils clear off the well up to 150m. radius (Measurement to be taken in the following stages from the level of the bottom of capping slab on well up to the bottom of cutting edge) through any kind of soil including rocky soil and rock till 25% of cutting edge (linear) comes in contact with rock including testing of bottom plug by dewatering the well upto 5 meters and checking the rise in water level as per clause 1208 of IRC Specification. Depth of sinking is reckoned from bed level. Sinking of 7 m external diameter Well - In any kind of soil including Clayey soil -					ROAD SOR 2018, PAGE-291, ITEM-12.10
		(i) Depth upto 3.0 M	m	3	₹ 10,237.00	₹ 30,711.00	
		(ii) Depth beyond 3.0 m upto 6.0 m	m	3	₹ 11,997.00	₹ 35,991.00	
		(iii) Depth beyond 6.0 m upto 10.0 m	m	4	₹ 14,822.00	₹ 59,288.00	
		Sub-Total				₹ 3,533,919.00	
		GST 12%				₹ 424,070.28	
		Total				₹ 3,957,989.28	

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Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

## Bill of Quantity for 1.5 MLD Pump House Super Structure

	Items	No	Length	Width	Height	Quantity	unit	
1	RCC M25	footing	4	0.8	0.8	0.5	1.280	
		column	8	0.3	0.3	8.2	5.904	
		below cable trench Foundation	1	20	1	0.15	3.000	
		tie & roof beam	16	4.8	0.3	0.3	6.912	
		roof	1	4.8	4.8	0.125	2.880	
		Ramp tie beam	1	4	0.3	0.3	0.360	
							20.336	
						Say	21.000	cum
2	Steel (Fe 500)	1% of conc. Vol.	1	21.000	of	1.2%	1.9782	
						Say	2.000	MT
3	Shuttering work reservoir (basement)	footing (without staging)	4	1.2	1.2	0.5	9.600	
			4	0.8	0.8	0.1	1.280	
		cable trench	1	20	1	0.1	4.200	
							15.080	
						Say	16.000	sq.m
		column (steel or ply)	8	0.3	0.3	8.2	78.720	
		tie & roof beam	16	4.8	0.3	0.3	69.120	
		roof	1	4.8	4.8	-	23.040	
		side of roof	1	19.2	0.125	-	2.400	
		Ramp	1	4	0.3	0.3	0.360	
						173.640		
					Say	174.000	sq.m	
4	Brick work (1:4)	Roof	4	4.8	0.25	1.2	5.760	
		cable trench	1	20	1	0.25	5.000	
							10.760	
						Say	11.000	cum
		super str. (extra 10% for inner wall)	4	4.8	0.25	5.7	30.096	



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		deduct for shutter opening	1	2.5	2.5	0.25	-1.563	
							28.534	
						Say	29.000	cum
5	20mm plaster (1:4)	plinth wall	4	4.8	1.2	-	23.040	
		super str. Wall	4	4.8	5.7	-	109.440	
							132.480	
						Say	133.000	sq.m
	15mm plaster (1:4)	cable trench wall	2	20	1	-	40.000	
		super str. Wall	4	4.8	5.7	-	109.440	
							149.440	
						Say	150.000	sq.m
	10mm plaster (1:4)	cable trench wall	4	4.8	5.7	-	109.440	
							109.440	
					Say	110.000	sq.m	



### Construction Cost of 1.5 MLD Pump House

Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	RCC	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mmmnominal size) excluding shuttering and reinforcement if any. in ground floorbas per relevant IS codes.	21.00	cu-mtr	₹ 6,053.05	₹ 127,114.08	Building Works SOR 2017, Vol I, p-32 item-18(ii), 3rd corrigenda. Rate analysis
2	Shuttering	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams,columns, lintels curved or straight including fitting, fixing and striking out after completion of work (Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)					P.W.D SOR-2017 Vol-I Page no. 42-43, item-26 (2.f)
		(a) 25 mm to 30 mm shuttering without staging in foundationaging					
		i) In foundation & ground floor	16.00	Sq-mtr	₹ 209.00	₹ 3,344.00	
		(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work					
		ii) In ground floor	174.00	Sq-mtr	₹ 368.00	₹ 64,032.00	
3	Reinforcement	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, bindees etc.including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) For steel/Mild Steel i) SAIL / TATA / RINL.					Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
		(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	2.00	M.T	₹ 60,443.00	₹ 120,886.00	
4	Brickwork	Brick work with 1st class bricks in cement mortar (1:4)					Building Work SOR 2017 Vol-I, Page no. 15, item -7(a), 3rd corrigenda
		a) In foundation & plinth	11.00	cu-mtr	₹ 5,560.00	₹ 61,160.00	
		b) In superstructure 1st floor.	29.00	cu-mtr	₹ 5,783.00	₹ 1,67,707.00	
5	Plastering	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging					Building Work SOR 2017 Vol-I, Page no 189 item-1(i) a, b,c 3rd



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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		where necessary (Ground floor).[Excluding cost of chipping over concrete surface]					corriganam
		i) With 1:4 cement mortar. a) 20 mm thick plaster ( internal )					
		i) In ground floor	133.00	sq-mtr	₹ 185.00	₹ 24,605.00	
		b) 15 mm thick plaster (external)					
		i) In ground floor	150.00	sq-mtr	₹ 160.00	₹ 24,000.00	
		c) 10 mm thick plaster (external)					
		i) In ground floor	110.00	sq-mtr	₹ 129.00	₹ 14,190.00	
6	Stone flooring	Artificial stone in floor, dado, staircase etc. with cement concrete (1:2:4) with stone chips, laid in panels as directed with topping made with ordinary/white cement(as necessary) and marble dust in proportion (1:2) including smooth finishing and rounding off corners and including application of cement slurry before flooring works, using cement @ 1.75Kg/sqm all complete including all materials and labour. In ground floor 3mm thick topping (High polishing grinding on this item is not permitted with ordinary cement.). Using Grey cement i) 35mm thick. a) In ground floor	172.00	Sq-mtr	₹ 320.00	₹ 55,040.00	Building Work SoR 2017 Vol-1, P-48, Item-19, corriganam 04.06.2018, Pg-21
7	Neat cement	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills, floor, drain etc. NOTE : Cement 0.152 cu.m. per 100 sq.m.	130.80	sq-mtr	₹ 34.00	₹ 4,447.20	Building Work SoR 2017 Vol-1, Page no 192, item-11
8	Gate	Collapsible gate with 40mm x 40mm x 6mm Tee as top and bottom guide rail, 20mm x 10mm x 2mm vertical channels 100mm apart in fully stretched position 20mm x 5mm M.S. flats as collapsible bracings properly rivetted and washered including 38mm steel rollers including locking arrangements, fitted and fixed in position with lugs set in cement concrete and including cutting necessary holes, chasing etc. in walls, floors etc. and making good damages complete.	4.00	sq-mtr	₹ 3,402.00	₹ 13,608.00	Building Work SoR 2017 Vol-1, Pg-106, Item-18
9	Steel role shutter gate	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G. of approved type steel latch section 75mm wide, fitted with coil wire spring to necessitate the fitting of required Nos. of C.I. Pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially builtup side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminium paint over a coat of red lead primer complete.	6.25	sq-mtr	₹ 3,270.00	₹ 20,437.50	Building Work SoR 2017 Vol-1, Page no 106, item-19, 3rd corriganam 04.06.2018
10	MS structural	M.S. structural works in columns, beams etc. with simple rolled					Building works SoR -



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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	Bill Reference
	works	structural members (e.g. posts, angle, channel sections) conforming to IS 226, IS 808 & SP (to) 1964 connected to one another with brackets, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS 816-1969 & IS 1995 using electrodes of approved make and brand conforming to IS 814-2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental charges such as electricity charges, labour insurance charges etc. Payment to be made on the basis of calculated weight of structural members only in finished work as per IS specified weight.					
		For built up sections / structural members of specified sections weighing not less than 22.5 Kg./m	0.50	MT	₹ 15,266.00	₹ 7,633.00	
11	Prime coat	Priming one coat of approved quality including smoothening surfaces by sand papering etc.	10.000	sq-mtr	₹ 79.00	₹ 790.00	Building Work, N.S. 2017, Pg.200, 201-202
12	Enamel painting	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary. (a) On steel or other metal surface: With super gloss (hi-gloss) - (i) Two coats (with any shade except white)	10.000	sq-mtr	₹ 79.00	₹ 790.00	Building Work, N.S. 2017, Pg.200, 201-202
13	Acrylic painting	Applying Exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface old or new surface to receive decorative textured (matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface thoroughly, complete. (a) One Coat - (i) In ground floor	150.000	%sq-mtr	₹ 4,510.00	₹ 6,765.00	Building work, N.S. 2017, Pg.196, 194-195
14	Decorative Acrylic exterior emulsion	Protective and Decorative Acrylic exterior emulsion paint of approved quality, as per manufacturer's specification and as per direction of Engineer-in-Charge to be applied over acrylic primer as required. The rate includes cost of material, labour, scaffolding and all incidental charges but excluding the cost of primer. In Ground floor (Two Coat) (a) Normal Acrylic Emulsion. (i) In ground floor	150.000	sq-mtr	₹ 47.00	₹ 7,050.00	Building Work, N.S. 2017, Pg.197, 194-195
15	Color washing	Colour washing with any shade with Stainers, as required including cleaning and smoothening surface thoroughly. (i) Internal surface (All floors) (b) Two coats (on new works only) (i) Other than yellow, pink	243.000	%sq-mtr	₹ 2,940.00	₹ 7,144.20	Building Work, N.S. 2017, Pg.196, 194-195



Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		(i) In ground floor					
16	Removal of Rubbish	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	50.000	cu-mtr	₹ 166.00	₹ 8,300.00	Building Work SOR 2017 Vol-I, Page no. 12, item-13
17	Catch-pit	Constructing catch pit to a depth of 1.0m (Inside) with 250mm th. 1st class Brick Work (1:4) in all sides over a layer of jhama brick soling & 100mm th. jhama cement concrete (1:4:8) including necessary earth work, providing approved type C.I. Syphone (150mm dia) with topping RCPC gully grid (5MT load bearing capacity) constructing invert with brick-on-edge, including 20mm th. inside cement plaster (1:4) finished with neat cement punning, at the top 100mm th. R.C.C. slab (1:1.5:3) with stone chips including necessary reinforcement, shuttering as per standard drawing and as directed by E-I-C complete in all respect and removal of surplus earth with all costs of labour and materials. Inside measurement of catch pit, 600mm x 525mm	1.000	Each	₹ 12,175.00	₹ 12,175.00	S&D Works SOR 2018-2019, pg-19, item -23
18	Rain Water Pipe	Supplying, fitting & fixing UPVC pipes A- Type and fittings conforming to IS-13592-1992 with all necessary clamps nails, including making holes in walls, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/Bitumen/M-Seal etc) complete. A) UPVC Pipes: (i) 75 mm. Dia.	5.000	m	₹ 188.00	₹ 940.00	Building Work SOR 2017 Vol-I, Page no. 212-213, item-21 a (i)
19	Windows & Ventilators	Supplying, fitting and fixing windows and ventilators with or without integrated grills conforming to IS 1038-1975 and manufactured from rolled steel sections conforming to IS 7452-1974 with non-friction projecting type, box type hinges, glazing clips, lugs locking bracket, handle plate etc, including hoisting in position, straightening if required, fixing lugs in cement concrete (1:2:4) with stone chips 20 mm down cutting holes and mending good damages to match with existing surface complete in all respect excluding glazing. (b) Openable steel windows as per IS sizes with side hung shutters and horizontal glazing bars. [The extra rate admissible for the openable portion only]	5.4	sq-mtr	₹ 1,663.00	₹ 8,980.20	Building Work SOR 2017 Vol-I, Page no. 107, ITEM -20 b
		(i) Fixed type ventilators as per I.S. sizes with horizontal glazing bars height being limited to 580 mm.	0.27	sq-mtr	₹ 107.00	₹ 28.89	Building Work SOR 2017 Vol-I, Page no. 108, ITEM - 20(c) i
19	window glass	Supplying and affixing optically clear polyester sun control window film having acrylic pressure sensitive adhesive on one side & an acrylic					Building Work SOR 2017 Vol-I, Page no.





## Soil Investigation Work For 5 MLD Pump Station

S.L. No	Description Of items	Quantity	Unit	Rate (Rs)	Amount (Rs.)
A	B	C	D	E	F
1	<p><b>Mobilisation charges</b> of all tools &amp; plants along with accessories, materials, labour, supervision etc at site of work required in connection with boring &amp; testing work, including setting up boring rigs and shifting to different Bore-hole points etc and also including withdrawal of same from the site after completion of work, complete as per direction of Engineer-in-Charge.</p> <p>b) Detailed investigation</p> <p>Note: payment will be made after successful completion of the work [Ref PWD(R &amp; B WORKS)/2018/P323/Item No 17 01(b)]</p>	1	Nos	₹ 25,000.00	₹ 25,000.00
2	<p>Labour for <b>making Bore-Holes</b> of 150 mm to 250 mm dia by any standard method to any depth below ground level/bed level in all kinds (for the purpose of collecting Disturbed and Undisturbed soil samples, conducting Standard Penetration Test at suitable intervals etc ) including preparation and submission of bore-log as per IRC 75 and 78 and Clause 2400 of Specification for Road &amp; Bridge Works (5th Revision), published IRC and also including hire charges of tools &amp; plants complete as per the direction of Engineer-in-Charge Revision), published IRC and also including hire charges of tools &amp; plants complete as per the direction of Engineer-in-Charge</p> <p>a) When casing pipe is used to prevent collapse of borehole (casing pipe to be finally withdrawn)</p>				
	(i) Depth 0 m to 10 m	10	m	₹ 340.00	₹ 3,400.00
	(i) Depth 10 m to 20 m	10	m	₹ 400.00	₹ 4,000.00
	(i) Depth 20 m to 30 m	10	m	₹ 470.00	₹ 4,700.00
	[Ref PWD(R & B WORKS)/2018/P323 / Item No 17 04 (a)(i,ii,iii)]				
3a	FIELD INVESTIGATION				
i)	Collection of Undisturbed soil sample from the bore hole to be made by the concerned Division / Party at their cost				
	(i) Depth 0.0m - 10.0m	1	Nos	₹ 230.00	₹ 230.00
	(i) Depth 10 m to 20 m	1	Nos	₹ 350.00	₹ 350.00
	[Ref PWD(R & B WORKS)/2018/P326/Item No 17 05 B(v)(i to iii)]				
ii)	Standard Penetration Tests (S P T ) by Split Spoon Sampler in the bore hole as per IS 2131.				
	(i) Depth 0.0m - 10.0m	3	Nos	₹ 350.00	₹ 1,050.00
	(i) Depth 10 m to 20 m	3	Nos	₹ 460.00	₹ 1,380.00
	(i) Depth 20 m to 30 m	3	Nos	₹ 570.00	₹ 1,710.00
	[Ref PWD(R & B WORKS)/2018/P326/Item No 17 05 B(vi)(i)]				
3b	LABORATORY INVESTIGATION				
i)	Liquid limit as per IS 2720 (Part - V)	1	Nos	₹ 350.00	₹ 350.00
ii)	Plastic Limit as per IS 2720 (Part - V)	1	Nos	₹ 350.00	₹ 350.00
iii)	Grain size analysis by Hydrometer Method as per IS 2720 (Part - IV)	1	Nos	₹ 690.00	₹ 690.00
iv)	Determination of Water Content as per IS 2720 (Part - II)	1	Nos	₹ 140.00	₹ 140.00
v)	Determination of Specific Gravity as per IS 2720 (Part - III)	1	Nos	₹ 460.00	₹ 460.00
vi)	Determination of Unconfined Compression Strength as per IS 2720 (Part - X)				



S.L. No.	Description Of items	Quantity	Unit	Rate (Rs)	Amount (Rs.)
A	B	C	D	E	F
	a) Undisturbed	1 Nos	each	₹ 690 00	₹ 690 00
vii)	Determination of Consolidation Properties as per IS 2720 (Part - XIV)	1 Nos	each	₹ 920 00	₹ 920 00
viii)	Tri-Axial Shear Test				
	a) Determination of Shear Strength Parameters of a specimen tested in Unconsolidated Undrained Tri-axial compression without measurement of pore water pressure as per IS 2720 (Part - XI)	1 Nos	each	₹ 920 00	₹ 920 00
4	[Ref. PWD(R & B WORKS)/2018/P324-325/Item No 17 05 A (i)(ii)(iv)(v)(vi)(viii a)(xiv)(xvi a)] Carriage of all Disturbed & Undisturbed Samples from site of work to the Divisional Office or elsewhere including loading and unloading as per direction of Engineer-in-Charge <b>Detailed Investigation.</b>  [ Ref PWD(R & B WORKS)/2018/P-323/Item No 17 02 ]	1 No	L S	₹ 1,600 00	₹ 1,600 00
5	Preparation and submission of report in 6(Six) copies giving all relevant information data like site plan, bore log and water table, test results, calculations, discussions, suggestions & recommendations in respect of suitable foundation etc including determination of silt factor calculation of waterways and complete design of foundation including analysis of Bearing Capacities and Settlements in bound and presentable from complete as per direction of Engineer-in-Charge  b) <b>Detailed Investigation</b>  [ Ref PWD(R & B WORKS)/2018/P330/Item No 17 08 (b) ]	1 No	L S	₹ 12,500 00	₹ 12,500 00
Total				₹	60,440 00

  
 Executive Engineer  
 W.B-1/GAP/W&B Sector,  
 K.M.D.A.



### Bill of Quantity for Electrical Switch room for 1.5 MLD LS

	Items		No	Length	Width	Height	Quantity	unit
1	Earthwork in excavatoin	upto 1500 depth	4	1	1	1.5	6.000	
						Say	6.000	cum
		1500 to 3000 depth	4	1	1	1.0	4.000	
						Say	4.000	cum
2	Earthwork in filling	upto 1500 depth	1	3.200	of	75%	2.400	
						Say	5.000	cum
3	Sand filling	in Foundation	4	1	1	0.3	1.200	
		in plinth	1	3	2.5	0.4	3.000	
		in ramp & stair	1	3	1.5	0.4	0.900	
							5.100	
						Say	10.000	cum
5	Shoring works	upto 1500 depth	4	1	1	1.5	24.000	sq.m
		1500 to 3000 depth	4	1	1	1.0	16.000	sq.m
6	Brick Flat Soling	Foundation	4	1	1	-	4.000	
		floor	1	3	2.5	-	7.500	
		ramp & stair	1	3	1	-	3.000	
							14.500	
						Say	15.000	sq.m
7	PCC (1:2:4)	Foundation	4	1	1	0.1	0.400	
		floor	1	3	2.5	0.1	0.750	
		below cable trench Foundation	1	3	1	0.1	0.300	
		ramp & stair	1	3	1	0.1	0.300	
							1.750	
						Say	5.000	cum
8	RCC M25	footing	4	0.6	0.6	0.5	0.720	
		column	4	0.2	0.2	6.1	0.976	
		below cable trench Foundation	1	3	1	0.1	0.300	
		tie & roof beam	3	11	0.3	0.3	2.970	
		roof	1	3	2.5	0.125	0.938	
		ramp tie beam	1	3	0.3	0.25	0.225	
							6.129	
						Say	8.000	cum
9	Steel (Fe 500)	1% of conc. Vol.	1	8.000	of	1.2%	0.7536	
						Say	0.800	MT
10	Shuttering work reservoir (basement)	footing (without staging)	4	1	1	0.1	1.600	
			4	0.6	0.6	0.1	0.960	



	Items	No	Length	Width	Height	Quantity	unit	
	cable trench	1	3	1	0.1	0.800		
						3.360		
					Say	5.000	sq.m	
	column (steel or ply)	4	0.2	0.2	6.1	19.520		
	tie & roof beam	1	11	0.3	0.3	9.900		
	roof	1	3	2.5	-	7.500		
	side of roof	1	11	0.15	-	1.650		
	ramp tie beam	1	3	0.3	0.25	2.550		
						41.120		
					Say	45.000	sq.m	
11	Brick work (1:4)	Foundation & plinth	4	3	0.3	0.25	0.900	
		cable trench	1	3	0.3	0.25	0.225	
						1.125		
					Say	5.000	cum	
		super str.	4	3	3	0.25	9.000	
		deduct for shutter opening	1	1	1.5	0.25	-0.375	
						8.625		
					Say	10.000	cum	
12	20mm plaster (1:4)	plinth wall	4	3	0.3	-	3.600	
		super str. Wall	4	3	2.5	-	30.000	
						33.600		
					Say	35.000	sq.m	
	15mm plaster (1:4)	cable trench wall	1	3	1	-	3.000	
		super str. Wall	4	3	2.5	-	30.000	
						33.000		
					Say	35.000	sq.m	
	10mm plaster (1:4)	cable trench wall	1	3	1	-	3.000	
						3.000		
					Say	5.000	sq.m	



### Construction of Electrical Switch room for 1.5 MLD LS

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. a) Depth of excavation not exceeding 1,500 mm.	6.00	% cu-mtr	₹ 11,927.00	₹ 715.62	Building Work SOR 2017 Vol-1, Page no. 1 item-2(a,b,c)
	b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm.	4.00	% cu-mtr	₹ 19,238.00	₹ 769.52	
2	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) a) With earth obtained from excavation of foundation.	5.00	% cu-mtr	₹ 7,754.00	₹ 387.70	Building Work SOR 2017 Vol-1, Page no. 1 item-3(a)
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity)	10.00	% cu-mtr	₹ 71,181.00	₹ 7,118.10	Building Work SOR 2017 Vol-1, Page no. 2 item-4(a)
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus /Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Engineer in charge) (i) For basement work and Depth upto 1.50 m.	24.00	sq-mtr	₹ 386.00	₹ 9,264.00	Building Works SOR 2017, Vol 1, p-3 item-6(a,b,c)
	(ii) For basement work and Depth beyond 1.50 m and upto 3.00 m.	16.00	sq-mtr	₹ 439.00	₹ 7,024.00	
5	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	15.00	sq-mtr	₹ 357.00	₹ 5,355.00	PWD Building SOR 2017 Vol-1, Page no. 14, item - 1, 3rd Corrigenda
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety, i) Ground Floor	5.00	cu-mtr	₹ 5,506.62	₹ 27,533.12	Building Work SOR 2017 Vol-1, Rate Analysis
7	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on	8.00	cu-mtr	₹ 7,575.51	₹ 60,604.10	Building Works SOR 2017 Vol-1, Rate Analysis

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Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation. i) With approved concrete pump.					
8	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work. (Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)					PwD Building work SOR - 2017, P-36/42(c)(d)
	(a) 25 mm to 30 mm shuttering without staging in foundationaging					
	i) In foundation & ground floor	5.00	Sq-mtr	₹ 209.00	₹ 1,045.00	
	(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work					
	ii) In ground floor	45.00	Sq-mtr	₹ 369.00	₹ 16,605.00	
9	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, bindes etc. including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL.					Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
	(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	0.80	M.T	₹ 60,443.00	₹ 48,354.40	
10	Brick work with 1st class bricks in cement mortar (1:4)					Building Work SOR 2017 Vol-I, Page no. 15, item - 7(a), 3rd corrigenda
	a) In foundation & plinth	5.00	cu-mtr	₹ 5,560.00	₹ 27,800.00	
	b) In superstructure 1st floor.	10.00	cu-mtr	₹ 5,783.00	₹ 57,830.00	
11	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface]					Building Work SOR 2017 Vol-I, Page no. 189 item-1(ii) a, b, c, 3rd corrigenda

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Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	i) With 1:4 cement mortar.					
	a) 20 mm thick plaster ( internal )					
	i) In ground floor	35.00	sq-mtr	₹ 185.00	₹ 6,475.00	
	b) 15 mm thick plaster (external)					
	i) In ground floor	35.00	sq-mtr	₹ 160.00	₹ 5,600.00	
	c) 10 mm thick plaster (external)					
	i) In ground floor	5.00	sq-mtr	₹ 129.00	₹ 645.00	
12	Artificial stone in floor, dado, staircase etc. with cement concrete (1:2:4) with stone chips, laid in panels as directed with topping made with ordinary/white cement(as necessary) and marble dust in proportion (1:2) including smooth finishing and rounding off corners and including application of cement slurry before flooring works, using cement @ 1.75Kg/sqm all complete including all materials and labour. In ground floor 3mm thick topping (High polishing grinding on this item is not permitted with ordinary cement.) Using Grey cement i) 35mm thick. a) In ground floor	30.00	Sq-mtr	₹ 337.00	₹ 10,110.00	Building Work SOR 2017 Vol-I, P-48, Item- 6(iii)
13	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills, floor, drain etc. NOTE : Cement 0.152 cu.m. per 100 sq.m.	27.10	sq-mtr	₹ 34.00	₹ 921.40	Building Work SOR 2017 Vol-I, P-192, Item- 15
14	Collapsible gate with 40mm x 40mm x 6mm Tee as top and bottom guide rail, 20mm x 10mm x 2mm vertical channels 100mm apart in fully stretched position 20mm x 5mm M.S. flats as collapsible bracings properly rivetted and washered including 38mm steel rollers including locking arrangements, fitted and fixed in position with lugs set in cement concrete and including cutting necessary holes, chasing etc. in walls, floors etc. and making good damages complete.	2.00	sq-mtr	₹ 4,330.00	₹ 8,660.00	Building Work SOR 2017 Vol-I, Pg-106, It-18 with 3rd corrigendum
15	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G. of approved type steel latch section 75mm wide, fitted with coil wire spring to necessitate the fitting of required Nos. of C.I. Pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially builtup side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminium paint over a coat of red lead primer complete.	4.00	sq-mtr	₹ 3,270.00	₹ 13,080.00	Building Work SOR 2017 Vol-I, Pg-106, It-19 with 3rd corrigendum
16	M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)- 1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816- 1969 &					Building works SOR - 2017, Pg-99/ It-1(III), with 3rd corrigendum



Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	IS-1985 using electrodes of approved make and brand conforming to IS 814-2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental charges such as electricity charges, labour insurance charges etc. Payment to be made on the basis of calculated weight of structural members only in finished work as per IS specified weight.					
	For built up sections - structural members of specified sections weighing not less than 22.5 Kg/m	0.50	MT	₹ 75,266.00	₹ 37,633.00	
17	Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	3.000	cu-mtr	₹ 29.00	₹ 87.00	Building Works SOR - 2017, Pg-200 / It-1 (a)
18	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary: (a) On steel or other metal surface: With super gloss (hi-gloss) (i) Two coats (with any shade except white)	3.000	cu-mtr	₹ 79.00	₹ 237.00	Building Works SOR - 2017, Pg-200, It-a(iv)
19	Applying Exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface old or new surface to receive decorative textured (matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface thoroughly, complete. (a) One Coat - (i) In ground floor.	35.000	%sq-mtr	₹ 4,510.00	₹ 1,578.50	Building Works SOR - 2017, Pg-196, It-8 (b)
20	Protective and Decorative Acrylic exterior emulsion paint of approved quality, as per manufacturer's specification and as per direction of Engineer-in-Charge to be applied over acrylic primer as required. The rate includes cost of material, labour, scaffolding and all incidental charges but excluding the cost of primer. In Ground floor (Two Coat) (a) Normal Acrylic Emulsion, (i) In ground floor	35.000	sq-mtr	₹ 67.00	₹ 2,345.00	Building Works SOR - 2017, Pg-196, It-8 (b)]
21	Colour washing with any shade with Stainers, as required including cleaning and smoothening surface thoroughly : (i) Internal surface (All floors) (b) Two coats (on new works only). (i) Other than yellow, pink (i) In ground floor	40.000	%sq-mtr	₹ 2,046.00	₹ 818.40	Building Works SOR - 2017, Pg-196 It-8 (b)
22	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	20.000	cu-mtr	₹ 166.00	₹ 3,320.00	Building Works SOR - 2017, P-12, item-13
Sub-Total					₹ 361,916.00	

  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.



### Estimate for Construction of Boundary Wall 2.0m Height at 1.5 MLD Pump House

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete.  (a) Depth of excavation not exceeding 1500 mm.  b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm. but not requiring shoring.  PWD's ( Bldg ) -2017, Pg-1 / It-2 (a),(b)	147.000  31.850	%Cum  %Cum	11927.00  19238.00	17532.69  6127.30
2	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work)  (a) With earth obtained from excavation of foundation.  It. No. 3(a) . Page-1 of PWD (B)-2017	134.138	%Cum	7754.00	10401.02
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity)  PWD's ( Bldg ) Schedule of Rates-2017, Pg-2 / It-4(A)	14.700	%Cum	71181.00	10463.61
4	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	84.000	Sq.M.	357.00	29988.00



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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	PWD's ( Bldg ) -2017, Pg-14 / It-1 with 3rd corrigendam 04.06.2018				
5	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.	84.000	Sq.M.	24.00	2016.00
	P-47/3-Pwd(B)-2017				
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement,if any, in gound floor as per relevant IS codes. a) Pakur Variety	7.000	Cu.M	5506.62	38546.37
	PWD's ( Bldg ) -2017, Pg-24 / It-4(a), with 3rd corrigendam 04.06.2018, rate analysis.				
7	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. (i) Pakur Variety	27.000	Cu.M	6053.05	163432.39
	PWD's ( Bldg ) -2017, Pg-26 / It-10(i), with 3rd corrigendam 04.06.2018, rate analysis.				
8	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. (a) For works in foundation, basement and upto roof of ground floor/upto 4 m				
	A) Tor steel/Mild Steel i) SAIL / TATA /	3.186	M.T.	60433.00	192539.54

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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	RINL. PWD's ( Bldg ) -2017, Pg-43 / It-40(a), with 3rd corrigendam 04.06.2018				
9	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)				
	(a) 25 mm to 30 mm thick wooden shuttering as per decision & direction of Engineer-In-Charge.	100.000	Sq.m	209.00	20900.00
	b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work.	114.000	Sq.m	369.00	42066.00
	PWD's ( Bldg ) Schedule of Rates-2017, Pg- 42 / It-36 (c )(f)				
10	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) i) In ground floor PWD's ( Bldg ) -2017, Pg-16 / It-16, with 3rd corrigendam 04.06.2018	108.00	Sq.M	722.00	77976.00
11	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding / staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface] With 1:4 cement mortar (i) 15 mm thick plaster. PWD's ( Bldg )-2017, Pg-189/It-1(ii)(b) with 3rd corrigendam 04.06.2018	347.000	Sq.M	160.00	55520.00

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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
12	Cement washing including cleaning and smoothening surface thoroughly (cement to be used @15 kg./100 sq.m. of surface for one coat and @25 kg./100 sq.m of surface for two coats): External surface (i) In ground floor (Two coats on new works only). P-195/5(b) of PWDSOR(B) - 2017.	347 000	%sq m	1424 00	4941 28
13	Applying decorative cement based paint of approved quality after preparing the surface including scraping the same thoroughly (plastered or concrete surface) as per manufacturer's specification. (i) In ground floor (Two coats on new works only). P-197/15(iii) of PWDSOR(B) - 2017.	347 000	Sq M	49 00	17003 00
14	M.S. gate of Jail type as per approved design made of strong M.S. frame work, intermediate stiffeners and round / square bars or angles M.S. sheet (not less than 14 gauge) gussets, cleats etc. including necessary riveting, bolting, welding, locking and hanging arrangements, fitting and fixing complete as per direction of the Engineer-in -charge. (a) In ground floor. PWD's ( Bldg ) -2017, Pg-105 / It-16. with 3rd corrigenda.	12 000	qntl	10090 00	121080 00
				Total = Rs	810,533 20
				Say Rs	810,533 00.

**Estimate for Construction of Storm Water Drain of 1.5 MLD pump house**

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including	37 00	%cum	11927 00	4412 99

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	removing, spreading or stacking the spoils within a lead of 75 m.as directed. The item includes necessary trimming thesides of trenches, levelling, dressing and ramming thebottom, bailing out water as required complete. a) Depth of excavation not exceeding 1,500 mm. PWD's ( Bldg ) -2017, Pg-1 / It-2 (a)				
2	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured. (This item should be executed on specific direction of the Enginner in charge) (a) Depth upto 1.5 m. It. No. 6(a)(b)(c) Page-3 of PWD (B)-2017	46.00	sq.m	386.00	17756.00
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) PWD's ( Bldg ) Schedule of Rates-2017, Pg-2 / It-4(A)	9.00	%Cum.	71181.00	6406.29
4	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand. PWD's ( Bldg ) -2017, Pg-14 / It-1 with 3rd corrigendam 04.06.2018	41.00	Sq.m.	357.00	14637.00
5	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches. (Ref: Item-3,Page-47, P.W.D.(Build) 2017	41.00	Sq.m.	24.00	984.00
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm	5.00	Cum.	5506.62	27533.12



Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	nominal size) excluding shuttering and reinforcement,if any, in ground floor as per relevant IS codes.Pakur Variety				
	PWD's ( Bldg ) -2017, Pg-24 / It-4(a), with 3rd corrigendam 04.06.2018, rate analysis.				
7	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)				
	(a) 25 mm to 30 mm shuttering without staging in foundation.	14.00	sqm	209.00	2926.00
	PWD's ( Bldg ) Schedule of Rates-2017, Pg- 42 / It-36 (c )(f)				
8	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) i) In ground floor	24.00	Sq.M	722.00	17328.00
	PWD's ( Bldg ) -2017, Pg-16 / It-16, with 3rd corrigendam 04.06.2018				
9	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding / staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface]  With 1:4 cement mortar (i) 15 mm thick plaster.	50.000	Sq.M	160.00	8000.00
	PWD's ( Bldg )-2017, Pg-189/It-1(ii)(b) with 3rd corrigendam 04.06.2018				
10	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills,	65.000	sq-mtr	34.00	2210.00

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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	floor, drain etc. Pwd (Building)-2017, P-192, It-15				
Total = Rs.					99983.40
Say Rs.					99,983.00

### Estimate of Approach Road for 1.5 MLD pump house

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
1	Earthwork in excavation for foundation of structures upto 3 m depth as per drawing and technical specification Clause 1104 for Rural Roads of MORD including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.	25.88	%cum	11927.00	3,086.11	Building Work SOR 2017 Vol-I, Page no. 1 item-2(a,b,c)
2	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) by ramming wherever necessary.	14.38	%cum	71181.00	10,232.27	Building Work SOR 2017 Vol-I, Page no. 2 item-4(a)
3	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.	57.50	sq.m	24.00	1,380.00	PWD( B)-2017, It-3, P-47
4	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	57.50	Sq.m.	357.00	20,527.50	PWD( B)-2017, Pg-2 / It-4(A)
5	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)					Pwd Building work SOR -2017, P-36/42(c)(f)



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	(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work	3.45	sq.m	369.00	1,273.05	
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety	5.75	cum	5506.62	31,663.09	Building Work SOR 2017 Vol-I, Rate Analysis
7	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. a) Pakur Variety	8.63	sq.m	6053.05	52,207.57	Building PWD SOR-2017, It-10(i), P-26, rate analysis
8	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL. (a) For works in foundation and upto roof of ground floor/upto 4 m.	0.81	MT	60443.00	49,108.43	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
9	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	24.58	cum	166.00	4,080.49	Building SOR PWD-2017, It-13, P-12
	Sub-Total				₹ 173,559.00	
	GST 12%				₹ 20,827.08	
	Total				₹ 194,386.08	

### Construction of septic tank

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
1	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	10.00	sq-mtr	₹ 361.00	₹ 3,610.00	Building Works SOR 2017 Vol-I, Rate

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
						Analysis
2	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety i) Ground Floor	5.00	cu-mtr	₹ 5,530.96	₹ 27,654.80	Building Works SOR 2017 Vol-I, Rate Analysis
3	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456. i) With approved concrete pump.	0.79	cu-mtr	₹ 7,765.01	₹ 6,146.01	
4	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work .(Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)					Pwd Building work SOR -2017, P-36/42(c)(f)
	(a) 25 mm to 30 mm shuttering without staging in found a tionaging i) In foundation & ground floor	10.00	Sq-mtr	₹ 209.00	₹ 2,090.00	
5	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, i) With approved concrete pump.	0.79	cum	₹ 7,765.01	₹ 6,146.01	Pwd Building work SOR -2017, P-36/42(c)(f)
6	Reinforcement for reinforced concrete work in all sorts of structures					



Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
	including distribution bars, stirrups, bindees etc including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL.					
	(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	0.10	M.T	₹ 60,433.00	₹ 6,043.30	Building Work SOR 2017 Vol-I , Page no. 15, item -7(a), 3rd corrigenda
8	Brick work with 1st class bricks in cement mortar (1:4) a) In foundation & plinth	5.00	cu-mtr	₹ 5,483.00	₹ 27,415.00	
						Building Work SOR 2017 Vol-I , Page no. 15, item -7(a), 3rd corrigenda
9	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	2.40	sq-mtr	₹ 714.00	₹ 1,713.60	Building Work SOR 2017 Vol-I , Page no. 189 item-1(i) a. b.c. 3rd corrigenda
10	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface] i) With 1:6 cement mortar. a) 25 mm thick plaster ( external ) i) In ground floor					
		50.00	sq-mtr	₹ 187.00	₹ 9,350.00	
11	Neat cement punning about 1.5mm thick in wall, dado, window sill, floor etc.	40.00	sq-mtr	₹ 34.00	₹ 1,360.00	Building Work SOR 2017 Vol-I , Page no.



Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
	NOTE: Cement 0.152 cu.m per 100 sq.m					192 item-15
12	Supplying, fitting & fixing UPVC pipes A- Type and fittings conforming to IS:13592-1992 with all necessary clamps nails, including making holes in walls, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/Bitumen/M-Seal etc) complete. A) UPVC Pipes: (i) 75 mm. Dia.	4.00	per/metre	₹ 118.00	₹ 472.00	Building Work SOR 2017 Vol-I, Page no. 212 item-A/(i)
	a) Plain Tee (i) 75 mm. Dia.	2.00	Each	₹ 102.00	₹ 204.00	Building Work SOR 2017 Vol-I, Page no. 212 item-a/(i)
				Sub-Total	₹ 92,204.71	
				GST 12%	₹ 11,064.57	
					₹ 103,269.28	

### Construction of TOILET

Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	10.00	sq-mtr	₹ 714.00	₹ 7,140.00	Building Work SOR 2017 Vol-I, Page no. 16 item-16
2	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface]	10.00	sq-mtr			Building Work SOR 2017 Vol-I, Page no. 189 item-1
	i) With 1:6 cement mortar.					
	a) 25 mm thick plaster ( external )					

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	i) In ground floor	10.00	sq-mtr	₹ 187.00	₹ 1,870.00	
	b) 15 mm thick plaster (internal) 1:4 cement mortar					
	i) In ground floor	0.00	sq-mtr	₹ 156.00	₹ 0.00	
	c) 10 mm thick plaster					
	i) In ground floor	2.88	sq-mtr	₹ 126.00	₹ 362.88	
3	18 mm. to 22 mm. thick, kota stone slab set in 20 mm thick(avg) cement mortar (1:4) in floor, stair & lobby including pointing in cement slurry with admixture of pigment matching the stone shade, including grinding & polishing as per direction of Engineer - in - charge to match with the existing work. [Slurry for bedding @ 4.4 kg/Sq.m and pointing @2.0 kg/Sq.m]	8.55	Sq-mtr	₹ 1,010.00	₹ 8,635.50	Building Work SOR 2017 Vol-I , Pg-54, It-17
4	Supplying, fitting & fixing best quality digital printed Ceramictiles in coloured decorative on walls and floors to match withthe existing work & 4 nos. key stones (10mm) fixed withadhesive 4.5 mm thick at the back of each tile & finishing the joints with white cement mixed with colouring oxide if required to match the colour of tiles including roughening of oncrete surface, if necessary or by synthetic adhesive & grout materials etc. With polymerised adhesive and epoxy grout pointing including spacer - 2mm (When tiles are laid overexisting hard ready surface) all complete as per direction ofEngineer-in-charge.	13.13	Sq-mtr	₹ 1,060.00	₹ 13,912.50	Building Work SOR 2017 Vol-I , Pg-68, It-39
5	Louvered window.i) Top, bottom and side member.	2.40	metre	₹ 196.00	₹ 470.40	Building Works SOR - 2017, Pg-238 / It-h/i
	PVC DOOR	1.00	each	₹ 1,900.00	₹ 1,900.00	MARKET RATE
6	Supplying and affixing optically clear polyester sun control window film having acrylic pressure sensitive adhesive on one side & an acrylicabrasion resistant coating on the other, with composition of infrared absorbing carbon & free from any optical defect. The filmcharacteristics should conform to ASTM E308, ASTM E903, ASTME84 and ASHIRAE. The film should be pasted after preparatory works without any cracking, delamination, bubbling, scouling and variation in total transmission of light across the width at any portion along the length doesn't exceed 2% over the average including scaffolding & relevant others to complete in all respect as permanufacturer's specification & direction of Engineer -in-Charge.(Note: This work should not	1.20	sq-mtr	₹ 544.00	₹ 652.80	Building Works SOR - 2017, Pg-206 / It-8/b

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Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	be executed without specific permission of Superintending Engineer(b) Superior Quality : Film Thickness - 2.0 Mil, Glare Reduction > 75%, U factor < 1.03, Emissivity < 0.70					
7	Sanitary plumbing				₹ 50,000.00	
	Total cost				₹ 84,944.08	

**Electro-Mechanical Components Design of 1.5 MLD Pump House  
(Near Hindustan in, Santragachi Jheel)**

*Executive Engineer*  
WB-1/GAP/W&B Sector,  
K.M.D.A.

Serial No	Description	Present Flow:		Projected Flow for 15 years (2036):		Projected Flow for 30 years (2051):		1.7 MLD			
		1.30 MLD	Quantity	1.50 MLD	Quantity	1.50 MLD	Quantity	Description	Units	Quantity	
<b>BASIC DATA FOR VERTICAL SHAFT CENTRIFUGAL PUMP</b>				<b>Factor</b>		<b>0.5</b>		<b>Factor</b>		<b>2.25</b>	
1	Discharge, Q	MLD	1.50	Discharge, Q	MLD	0.748893916	Discharge, Q	MLD	3.37002262		
		lps	17.336		lps	8.668		lps	39.005		
		lpm	1040.130		lpm	520.065		lpm	2340.293		
		m3/sec	0.017		m3/sec	0.009		m3/sec	0.039		
		m3/min	1.040		m3/min	0.520		m3/min	2.340		
		m3/hr	62.408		m3/hr	31.204		m3/hr	140.418		
		m3/day	1497.78783		m3/day	748.8939155		m3/day	3370.02262		
2	Head										

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	Static Head	m	7.313
	Entry Exit Loss	m	0.04
	Rising Main Loss	m	0.42
	Pumping Plant Loss	m	0.102
	Total	m	7.877
	Say	m	8
3	Rising Main Diameter	mm	250
4	Rising Main Length	m	150

**PUMP CONFIGURATION**

5	Pump Quantity of Type-I	DWF		Pump Quantity of Type-II	1/2-DWF		Pump Quantity of Type-II	2.25-DWF	
	Working	Nos	1	Working	Nos	1	Working	Nos	1
	Stand-By	Nos	1	Stand-By	Nos	1	Stand-By	Nos	0
6	Sewage flow to be pumped	m <sup>3</sup> /day	1497.78783 1	Sewage flow to be pumped	m <sup>3</sup> /day	748.8939155	Sewage flow to be pumped	m <sup>3</sup> /day	3370.02262
7	Operating Hours	Hours	24	Operating Hours	Hours	24	Operating Hours	Hours	24
8	Required Capacity of Each Pump	m <sup>3</sup> /hr	62.41	Required Capacity of Each Pump	m <sup>3</sup> /hr	31.20	Required Capacity of Each Pump	m <sup>3</sup> /hr	140.42
9	Provided Capacity of Each Pump	m <sup>3</sup> /hr	63.00	Provided Capacity of Each Pump	m <sup>3</sup> /hr	32.00	Provided Capacity of Each Pump	m <sup>3</sup> /hr	141.00
		lps	17.50		lps	8.89		lps	39.17
<b>MOTOR CAPACITY</b>									
10	Discharge	lps	17.50	Discharge	lps	8.89	Discharge	lps	39.17
11	Head	m	8	Head	m	8	Head	m	8
12	Specific Gravity		1.03	Specific Gravity		1.03	Specific Gravity		1.03
13	BHP = $Q$ in lpm X Head in m X Sp. Gravity/4500	HP	1.923	BHP = $Q$ in lpm X Head in m X Sp. Gravity/4500	HP	0.977	BHP = $Q$ in lpm X Head in m X Sp. Gravity/4500	HP	4.303

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14	Pump Efficiency		80%	Pump Efficiency		80%	Pump Efficiency		80%
15	BHP input to Pump	HP	2.403	BHP input to Pump	HP	1.221	BHP input to Pump	HP	5.379
16	BKW to Pump	KW	1.794	BKW to Pump	KW	0.911	BKW to Pump	KW	4.014
17	Consider margin as per Manual		15%	Consider margin as per Manual		15%	Consider margin as per Manual		15%
		HP	2.827		HP	1.436		HP	6.328
		KW	2.110		KW	1.072		KW	4.722
18	Provided Capacity of Motor	HP	3.000	Provided Capacity of Motor	HP	2	Provided Capacity of Motor	HP	7
19	Operating Voltage	200+/-6% VOLT AC		Operating Voltage	200+/-6% VOLT AC		Operating Voltage	200+/-6% VOLT AC	
			POWER CALCULATION		1DWF + 1/2DWF	2DWF			
20	Load of Pumps	HP	5	7					
		KW	3.731	5.224					
21	Incoming Load	KVA	4.146	5.804					
22	Miscellaneous Load	KVA	0.083	0.116					
23	Total Load	KVA	4.229	5.920					
						CALCULATION OF D.G. SET			
24	Considering 10% margin and 0.8 power factor for flow = Load*1.1/2*0.8				KVA	2.907	4.070		
	Say				KVA	3	5		
25	Check for Starting current; KW = 1.7321xVxIxPF				AMP	6.489	9.084		
26	Current of Auxilary Load				AMP	0.616			
27	Total Current when one pump running				AMP	7.105			
28	Starting Current of Pump on Soft Starter				AMP	36.336			
As we are using Star Delta Motor, starting current requirement is 4 times of motor rating									



29	Total Current	AMP	43.441
30	DG Sets are designed to withstand 50% overload for 30 Seconds	AMP	32.910
		KVA	23.676
	Say	KVA	45
Hence , Provide DG Set of 45 KVA			

**TRANSFORMER CAPACITY (1W+1S)**

31	To ensure peak efficiency at about 75% of the rating, margin taken as 20%		
32	Total Peak Load with 20% margin and 0.8 PF	KVA	48.321
33	Total Current	AMP	32.910
		KVA	23.676
	Say	KVA	45

**Design of Column Pipe**

		1/2 DWF	1 DWF	2.25 DWF
34	Pump Capacity, m3/day	748.894	1497.788	3370.023
35	Pipe material	CI / DI	CI / DI	CI / DI
36	Desired Velocity, m/s	1.5	1.5	1.5
37	Area needed, Sq.m.	0.0058	0.0116	0.0260
38	Dia needed, m	0.0858	0.1213	0.1819
39	Dia needed, mm	86	122	182
40	Dia provided, mm	150	200	250

Provide 150mm, 200mm & 250mm respectively for 1/2 DWF, 1DWF & Peak DWF pipelines at zero year and change pumpsets at 16th year  
The augmentation at 16th year can be decided based on realistic condition at that time

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### Electro-mechanical Cost of 1.5 MLD Pump House

Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
1	Pump (Type - I)	Supply, Installation, Testing & Commissioning of Submersible Pump haqing a head discharge characteristic of <b>31 m<sup>3</sup>/hr</b> , along with new column pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor	2	Set	₹ 139,500.00	₹ 279,000.00	Market rate
2	Pump (Type - II)	Supply, Installation, Testing & Commissioning of Submersible Pump haqing a head discharge characteristic of <b>61 m<sup>3</sup>/hr</b> , along with new column pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor	2	Set	₹ 149,990.00	₹ 299,980.00	Market rate
3	Pump (Type - III)	Supply, Installation, Testing & Commissioning of Pump haqing a head discharge characteristic of <b>136 m<sup>3</sup>/hr</b> , along with new column pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor	1	Set	₹ 224,500.00	₹ 224,500.00	Market rate
4	Column Pipe (CI/DI)	Supply storage & installation of pump individual 150 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	2	Job	₹ 1,320.36	₹ 2,640.72	WS (UD & MA)-2018 Pg-(5-6), Item - 2.1.2 Rate analysis
		Supply storage & installation of pump individual 200 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	2	Job	₹ 1,713.26	₹ 3,426.52	
		Supply storage & installation of pump individual 250 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	1	Job	₹ 2,276.78	₹ 2,276.78	
5	Valves (Type-I)	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 150 NB & DJ complete as per requirement for pump individual delivery.	2	Job	₹ 17,891.00	₹ 35,782.00	WS (UD & MA)-2018 pg-18 & 48 item-2.4.1
6	Valves (Type-	Supply, storage & installation of various dia. CIDF actuator	2	Job	₹ 31,508.00	₹ 63,016.00	



Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
	II)	operated B/F valves NRV of 200 NB & DJ complete as per requirement for pump individual delivery.					& 8.8 Rate analysis
7	Valves (Type-II)	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 250 NB & DJ complete as per requirement for pump individual delivery.	2	Job	₹ 44,522.00	₹ 89,044.00	
8	EOT Crane	Supply, storage & installation of 3MT/5MT capacity EOT crane including MS inspection ladder all complete.	1	Job	₹ 681,850.00	₹ 681,850.00	Market rate
9	Level Sensor	Supply, Installation, Testing & Commissioning of ultrasonic level sensor including transmitter/transducer, signal cable, stilling pipe on the wet sump along with placing the display converter unit at suitable place near the control desk along with connection to the level meter on the control desk	1	Job	₹ 70,546.00	₹ 70,546.00	Market rate
10	LT Panel	Supply, storage & installation of LT MCC cum PDB as per specification in S/S building.	1	Nos	₹ 58,000.00	₹ 58,000.00	Rate analysis
11	DG	Supply, Commission of 45KVA DG	1	Job	₹ 442,000.00	₹ 442,000.00	Market rate
12	LT Cables	Supply, Installation, Testing of all HT/LT cables as required to complete the entire pumping station along with termination kits, and pipe protections, as required	1	Job	₹ 1,503,209.70	₹ 1,503,209.70	Rate analysis
13	Earthing	Supply, storage & installation of total earthing system for the entire installation as per specification.	1	Job	₹ 85,000.00	₹ 85,000.00	Rate analysis
14	RCC Chair Thrust Block	Supply, Installation of RCC chair thrust blocks of suitable size as required to complete the pump supports, valve supports, piping layout etc	1	Lot	₹ 25,000.00	₹ 25,000.00	Market rate
15	Lightning System	Supply, Storage & Installation of lightning Protection system as per Specification	1	Lot	₹ 50,000.00	₹ 50,000.00	Market rate
16	Steel Fabrication Work	Supply, installation of structural steel work for pedestal, panel mounting support walkway, cable tray etc all completes as per specification and direction by EIC	1	Lot	₹ 810,333.33	₹ 810,333.33	Market rate



Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
17	Fire Extinguisher	Supply, Installation, Testing & Commissioning of Fire extinguishers along with sand buckets as required	1	No	₹ 7,198.00	₹ 7,198.00	Market rate
18	Safety Instrument	Supply of Rubber mat, Hand Gloves, First Aid Box etc.	1	No	₹ 3,226.00	₹ 3,226.00	Market rate
19	Illuminating system	Supply, Storage & Installation of internal & external illuminating system as per specification with timer	1	No	₹ 401,115.00	₹ 401,115.00	Market rate
20	Ventilation System	Supply, Storage & Installation of ventilation system as per specification	4	No	₹ 7,700.00	₹ 30,800.00	Market rate
21	Automatic Screener	Supply, Installation, Testing & Commissioning of electrically operated double stainless steel screen of 5 ton capacity with vertical lifting arrangement along with all accessories like guide channels, rests etc as required to complete the job. Hand Trolleys, scrapers, gloves as required are also to be included	1	Lot	₹ 1,750,000.00	₹ 1,750,000.00	Market rate
22	Penstock Gate	Supply, Installation, Testing & Commissioning of Penstock gates with extended spindle and hand wheel, guide frame complete as required (1200 x 1200 mm)	1	No	₹ 185,007.00	₹ 185,007.00	Market rate
23	Paintings	Painting all the electro-mechanical installations, railings, shutters, sundry materials, nuts, bolts, grease, jute etc.	1	Lot	₹ 500,000.00	₹ 500,000.00	Market rate
24	Trial Run	Testing, trial run, commissioning cum operation maintenance of the entire system for 6 months to achieve the desired objective	1	Lot	₹ 100,000.00	₹ 100,000.00	Market rate
25	Technical Assistance	One Year technical assistance and guarantee towards maintenance of the newly installed equipment's	1	Lot	₹ 100,000.00	₹ 100,000.00	Market rate
26	Flow meter	Supply, fitting & fixing flow meter including all arrangements for pumping station	1	Lot	2,45,000.00	₹ 2,45,000.00	Market rate
TOTAL.						₹ 8,047,951.05	

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# NEW LS-7.5 OUTLET

A	Cost of Wet Well	₹ 4,233,345.00
B	Cost of Pump house	₹ 823,257.81
C	Soil Test	₹ 60,440.00
D	Cost of Switch room	₹ 650,798.00
E	Cost of Boundary Wall	₹ 886,720.64
F	Cost of Storm water Drain	₹ 109,696.56
G	Cost of Storm lock gate	₹ 1,469,053.22
H	Cost of Approach road	₹ 196,197.00
J	Cost of Septic tank	₹ 92,204.71
L	Cost of Toilet	₹ 84,944.08
	TOTAL	₹ 8,606,657.02
	with 12% GST	₹ 9,639,455.86
K	Electro-Mech. Cost	₹ 9,715,801.12
	with 18% GST	₹ 11,464,645.32



Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

## NEW LS OUTLET-7.5 MLD

Flow	7.500	MLD
Screen Chamber Size	1.5 m Width X 1 m Length X 1 m Liquid Depth + 0.35 m Free Board	
Inlet Chamber Size	2 m Width X 3.4 m Length X 1 m Liquid Depth + 0.35 m Free Board	
Wet Well Size	5.7 m Well Diameter X 2 m Liquid Depth + 0.6 m Free Board	
Ground Level	99.276	m
Invert Level of Incoming Sewer	97.026	m
Invert Level of Wet Well	94.426	m
Sump Depth	4.9	m
Pump Type I	DWF/2	
Capacity	157.00	m <sup>3</sup> /hr
Head	9	m
Motor Capacity	8	HP
Pump Type II	DWF	
Capacity	313.00	m <sup>3</sup> /hr
Head	9	m
Motor Capacity	16	HP
Pump Type III	2.25 DWF	
Capacity	703.00	m <sup>3</sup> /hr
Head	9	m
Motor Capacity	36	HP
Capacity of DG	250	KVA
Capacity of Transformer	250	KVA
Power Requirement	50.80	KW
Civil Cost	₹ 7,506,947.00	
Electro-Mechanical Cost	₹ 15,672,851.12	



**Design of 7.5 MLD Pumping Station  
At Santragachi Jheel**

Particulars	Value	Units		
Average Flow	8.5	MLD	LOCATION:	
	8466	m3/day	Average Flow, MLD	8.466
	352.740	m3/hr	Peak Flow, MLD	19.048
Peak Factor	2.25	-	Peak Flow, lps	220.462
Peak Flow	19.048	MLD	Peak Flow, m3/sec	0.220
	19048	m3/day	Pumping Main Length, m	1000
	793.665	m3/hr	Static Head, m	5.350
	13.228	m3/min	Design Period, Year	15
	0.220	m3/sec	Combined Pump Efficiency	75%
	220.462	lps	Pumping Hour	24
Invert Level of Incoming Sewer	98.676	m		
Ground Level	99.276	m	Modified Hazen William's Formula	$V = 143.534 C_R r^{(0.6575)} S^{(0.5525)}$
Finished Floor Level	99.776	m		$h = [L(Q/C_R)^{1.81}] / [994.62 D^{4.81}]$
<b>INLET CHAMBER</b>			Pump Capacity, m3/hr	352.74
Hydraulic Retention Time, HRT	0.5	min	Pipe Diameter, mm	450
Volume of Chamber	6.614	m3	Hydraulic Mean Depth, m	0.1125
Liquid Depth	1.000	m	Area, m2	0.159
Area	6.614	m2	Pipe Loss, m	3.03
Width	2.0	m	Pipe Material	CI / DI - Unlined
Length	3.3	m		
Free Board	0.35	m	Cr Value	1

Size Provided	2 m X 3.4 m X 1 m LD +0.35 m FB		Slope, 1 in	0.00303		
<b>SCREEN CHAMBER</b>			Slope	330.00		
Velocity through Screen at Avg Flow	0.6	m/sec	Velocity, m/sec	1.386		
Velocity through Screen at Peak Flow	1.0	m/sec	Entry & Exit Loss, m	0.098		
Calculated Clear Area of openings at Average Flow	0.163	m <sup>2</sup>	HEAD LOSS, m	3.131		
Calculated Clear Area of openings at Peak Flow	0.220	m <sup>2</sup>	5% Margin for Frictional Loss	0.157		
Provided Area	0.220	m <sup>2</sup>	FITTING LOSSES	K-Value	No. of Items	Total Loss
Water Depth	1.000	m	Sudden Contraction	0.5	1	0.5
Calculated Clear Width of Openings through Rack	0.220	m	Entrance Shape Well Rounded	0.5	0	0
Spacing between Bars	50	mm	Elbow 90 Degrees	1	1	1
Number of Spacings	4.409	Nos	Elbow 45 Degrees	0.75	0	0
Number of Bars	3.409	Nos	Elbow 22 Degrees	0.5	0	0
Bar Size	10	mm	Tee 90 Degrees	1.5	0	0
Total Width of Screen Chamber Required	0.255	m	Tee in Straight Pipe	0.3	0	0
Provided Screen Width	0.455	m	Gate Valve Open	0.4	1	0.4
Actual Velocity through Screen at Average Flow	0.444	m/sec	Valve with Reducer and In increaser	0.5	0	0
Actual Velocity through Screen at Peak Flow	1.0	m/sec	Globe Valve	10	0	0
Approach Velocity at Average Flow	0.216	m/sec	Angle	5	0	0
Approach Velocity at Peak Flow	0.485	m/sec	Swing Check	2.5	0	0
Free Board	0.35	m	Venturi Meter	0.3	0	0
Headloss through Screen, $h = 0.0729 X (V^2 - v^2)$ ; Where V = Velocity through screen at peak flow, v = Approach Velocity at Peak Flow			Orifice	1	0	0

Headloss through Clear Screen	55.8	mm			
Headloss through 50% clogged Screen	274.5	mm	HEAD LOSS from Fitting, m		0.186
Screen Chamber Length	1.465	m			
Screen Chamber Width	1.000	m	Center of Pipe at Discharge Point, m		99.776
Screen Chamber Liquid Depth	1	m	I.L. at Suction Sump, m		94.426
Screen Chamber Free Board	0.350	m			
Bar Inclination	70.00	Degree			
SIZE PROVIDED	1.5 m X 1 m X 1 m LD + 0.35 m FB		Calculated Head, m		8.823
<b>WET WELL</b>			Total Head Provided, m		9.000
Hydraulic Retention Time, HRT	15	min			
Volume	49.604	m <sup>3</sup>			
Liquid Depth	2	m			
Area	24.802	m <sup>2</sup>			
Diameter Required	5.621	m			
Diameter Provided	5.7	m			
Free Board	1.0	m			
SIZE Required	5.7 m Diameter X 2 m LD + 1 m FB				
Assumption, Pumps are placed at both side of the intermediate passage of Wet Well. Now as per Pump arrangements the Diameter will be :			Greater value has been taken as Actual Dia of Wetwell Hence, Liquid Depth and Free Board will be;		
Pump width	500	mm	Actual Dia provided	5.7	m
Center to Center distance	600	mm	Area	25.510	m <sup>2</sup>
No of Pumps	5	nos	Liquid Depth (Actual)	2	m
Diameter of wet well	4.2	m	Free Board (Actual)	0.6	m
Actual SIZE PROVIDED	5.7 m Diameter X 2 m LD + 1 m FB				

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### Bill of Quantity for Civil Estimation of 7.5 MLD Pump House

Parameters			Unit	Quantity			
				Wet Well	Inlet Chamber	Screen Chamber	TOTAL
Proposed Size	Length	(L)	m	5.700	3.4	1.5	10.600
	Depth	(D)	m	2.600	1.35	1.35	5.300
	Width	(B)	m	5.700	2	1	8.700
	Floor Slab Thickness	(Tf)	m	0.500	0.25	0.25	1.000
	Roof Slab Thickness	(Tr)	m	0.000	0	0	0.000
	Wall Thickness	(Tw)	m	0.500	0.25	0.25	1.000
Ground Level			m	99.276	99.276	99.276	297.828
IL of incoming Sewer			m	97.026	98.676	98.376	294.078
Invert Level			m	94.426	97.326	97.026	288.778
Excavation	Depth		m	7.300	2.450	2.750	13.000
	Width		m	6.850	3.500	2.500	13.000
	Length		m	6.850	4.900	3.000	15.000
Earthwork Excavation	0-1.5m		Cum	70.384	25.725	11.250	108.000
	1.5-3.0m		Cum	70.384	16.292	9.375	97.000
	3.0-4.5m		Cum	201.767	0.000	0.000	202.000
Sand Filling		0.075m	Cum	3.519	1.286	0.563	6.000
Single Layer BFS			Sq.m.	47.000	17.250	7.500	72.000
PCC		100mm	Cum	4.692	1.715	0.750	8.000
							0.000
RCC	Top slab	500mm	Cum	70.545	1.7	0.375	73.000
	intermediate slab	300mm	Cum	42.327	0	0	43.000
	bottom slab	300mm	Cum	0.000	0	0	0.000
	bottom plugging	1350mm	Cum	190.471	0	0	191.000
	Wall	500mm	Cum	47.255	3.9825	3.19875	55.000
Brickwork			Cum	0.000	0	0	0.000
Plaster			Sq.m.	0.000	17.28	8	26.000
DPC			Sq.m.	0.000	8.16	1.8	10.000
Flooring			Sq.m.	0.000	0	0	0.000
Neat Cement			Sq.m.	0.000	17.28	8	26.000
Shoring	0-1.5m		Sq.m.	41.100	25.200	16.500	83.000
	1.5-3.0m		Sq.m.	41.100	15.960	13.750	71.000
	3.0-4.5m		Sq.m.	117.820	0.000	0.000	118.000
Earthwork Filling			Cum	73.310	28.542	16.725	119.000



Reinforcement			MT	7.012	0.114	0.071	8.000
Shuttering	Staging		Sq.m.	261.750	29.250	13.500	305.000
	Without Staging		Sq.m.	143.000	9.750	2.250	155.000
Well Edging			MT	2.500	0.000	0.000	2.500
bored cast-in-situ pile 10m (450mm)			m	0.000	80.000		80.000
pile cap			Cum	0.000	2.400		2.400
pile reinforcement			MT	0.000	1.395		1.395
Removal of Rubish			Cum	269.250	13.500	4.000	287.000
Proposed Stair Size	Length	(L)	m	4.850			
	Spacing		m	0.3			
	anchor length@0.6m		m	2.4			
	steps@0.3m	(S)	no	17.0			
	Width	(B)	m	0.6			
	Steel Density		kg/m <sup>3</sup>	7850			
	width of bar	b	m <sup>2</sup>	0.1			
	thickness of bar	t	m	0.035			
weight	W	MT	0.565985	0	0	0.565985	



### 7.5 MLD Pump Wet Well Cost

Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
1	Surface Dressing	Surface Dressing of the ground in any kind of soil including removing vegetation inequalities not exceeding 15 cm depth and disposal of the rubbish within a lead upto 75 m as directed.	Sq.m	92.22	₹ 10.00	₹ 922.20	Building Work SOR 2017 Vol-1, Page no. 1 item-1
2	Excavation	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or m. as directed. The item includes necessary trimming stacking the spoils within a lead of 75 the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. Depth of excavation not exceeding 1,500 mm.	%cu m	108.00	₹ 11,927.00	₹ 12,881.16	Building Work SOR 2017 Vol-1, Page no. 1 item-2(a,b,c)
		b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm. but not requiring shoring.	%cu m	97.00	₹ 19,238.00	₹ 18,660.86	
		c) Depth of excavation for additional depth beyond 3000 mm. upto 4000mm. excluding cost of shoring as necessary.	%cu m	202.00	₹ 23,470.00	₹ 47,409.40	
3	Shoring	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m	Sq.m	83.00	₹ 386.00	₹ 32,038.00	Building Works SOR 2017, Vol 1, p-3 item-6(a,b,c)
		(b) For additional depth beyond 1.5 m. and upto 3.00b m	Sq.m	71.00	₹ 439.00	₹ 31,169.00	
		c) For additional depth beyond 3.00 m.	Sq.m	118.00	₹ 498.00	₹ 58,764.00	
4	Filling	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) (a) With earth obtained from excavation of foundation.	%Cu m	119.00	₹ 7,754.00	₹ 9,227.26	Building Work SOR 2017 Vol-1, Page no. 1 item-3(a)
5	Removal of Rubbish	Removal of rubbish,earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of	cum	287.00	₹ 166.00	₹ 47,642.00	Building Work SOR 2017 Vol-1, Page no. 12 item-13

Sl No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
		Engineer in charge					
6	Sand Filling	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity). 150 mm layer (B) Do by fine sand.	%cu m	6.00	₹ 95,183.00	₹ 5,710.98	Building Works SOR page 2, item-4b 5th CORRIGENDA & ADDENDA
7	BFS	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	sqm	72.00	₹ 357.00	₹ 25,704.00	PWD SOR Vol-1, Page no. 14, item -1, 3rd Corrigenda
8	Shuttering & Centering	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor) 25mm to 30mm thick wooden shuttering as per decision and Direction of engg in charge	sqm	305.00	₹ 334.00	₹ 101,870.00	PWD SOR Vol-1, Page no. 42-43, item-36 (a.f)
		f) 25 mm to 30 mm shuttering without staging in foundation	sqm	155.00	₹ 209.00	₹ 32,395.00	
9	PCC	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. Pakur Variety	cum	8.00	₹ 5,506.62	₹ 44,053.00	Building Work SOR 2017 Vol-1, Rate Analysis
10	RCC	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/supplier] In ground floor and foundation. i) With approved concrete pump.	cum	173.40	₹ 7,575.51	₹ 1,313,593.95	Building Works SOR Vol-1, Rate Analysis

Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
11	Reinforcement	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation, basement and upto roof of ground floor/upto 4 m Tor steel/Mild Steel SAIL/ TATA/RINL	MT	9.40	₹ 60,443.00	₹ 567,861.99	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
12	Plastering	Plastering Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor) [Excluding cost of chipping over concrete surface] 20 mm thick plaster with 1:4 cement mortar	sqm	26.00	₹ 185.00	₹ 4,810.00	Building Work SOR 2017 Vol-I, Page no. 189, item-1(ii) a 3rd Corrigenda
13	Punning	Neat cement punning about 1.5mm thick in wall, dado, window sill, floor etc. Cement 0.152 cu.m per100 sq.m.	sqm	26.00	₹ 34.00	₹ 884.00	Building Work SOR 2017 Vol-I, Page no. 192, item-15
14	DPC	25 mm. thick damp proof with cement concrete (1:1.5:3) (with graded stone aggregate 10 mm. normal size) and painting the top surface with a coat of bitumen [VG.40 ] using 1.7 kg. per sq.m. including heating the bitumen and cost and carriage of all materials complete. [Bitumen to be supplied by the Agency]	Sqm	10.00	₹ 263.00	₹ 2,630.00	Building Work SOR 2017 Vol-I, Page no. 47, item-1 3rd Corrigenda
15	MS Structural Work	M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)- 1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-incharge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816- 1969 & IS: 1995 using electrodes of approved make and brand conforming to IS:814- 2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental chages such as electricity charges, labour insurance charges etc. III) For built up sections / srctural members of specified sections weighing not less than 22.5 Kg./m					Building Work SOR 2017 page-99 item-1(i) 3rd CORRIGENDA Vol-I, Page no. 84

Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
		a Fabrication, Erecting and laying steel cutting edge for well kerb	MT	2.50	₹ 75,266.00	₹ 188,165.00	
		b stair	MT	0.57	₹ 75,266.00	₹ 42,599.43	
16	RC Concreting	RCC Supplying ready mixed concrete of M 25 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. In bottom plug	Cum	191.00	₹ 7,419.51	₹ 1,417,126.98	Building Work SOR 2017 Vol-I RATE ANALYSIS
	Pile for Inlet and grit chamber	Providing Bored Cast-in-situ _____ grade R.C.C. pile in position as per specifications in all kinds of soil including cost of boring using drilling mud to stabilize the bore and flushing the bore of excess mud with freshly prepared drilling fluid by using pumps prior to placing concrete by tremie pipe in one continuous operation and including the cost of all materials and labour for placing of concrete and also including the cost of mobilization and hire charges of all equipment necessary for boring, welding of reinforcement cage as necessary and lowering of reinforcement cage, preparation and placing of concrete, including the cost of concrete but excluding the cost of reinforcement and labour for bending binding etc. complete as per Drawing and Technical Specifications and removal of excavated earth with all lifts and lead upto 1000 m. Work to be executed as per IS: 2911 (Part II Sec 2).iv) Pile diameter - 600 mm.	RM	80.00	₹ 1,636.00	₹ 130,880.00	Building Work SOR 2017 Vol-I, Page no. 36 item-24
17	Well Sinking	Sinking of Well as per IRC specification through all types of strata namely sandy soil, clayey soil and rock as shown against each case, including drawing Foundation Wells true to position and plumb with dia under cutting edge as mentioned below, including hire charges of all tools and plants etc. and supplying power, dewatering etc, initial excavation of earth complete as per drawing and technical specifications and direction of the Engineer-in-charge including throwing					ROAD SOR 2018, PAGE-291, ITEM-12.10

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Sl. No	Item	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
		the spoils clear off the well up to 150m. radius (Measurement to be taken in the following stages from the level of the bottom of capping slab on well up to the bottom of cutting edge) through any kind of soil including rocky soil and rock till 25% of cutting edge (linear) comes in contact with rock including testing of bottom plug by dewatering the well upto 5 meters and checking the rise in water level as per clause 1208 of IRC Specification. Depth of sinking is reckoned from bed level. Sinking of 7 m external diameter Well - In any kind of soil including Clayey soil -					
		(i) Depth upto 3.0 M	m	3	₹ 10,237.00	₹ 30,711.00	
		(ii) Depth beyond 3.0 m upto 6.0 m	m	3	₹ 11,997.00	₹ 35,991.00	
		(iii) Depth beyond 6.0 m upto 10.0 m	m	2	₹ 14,822.00	₹ 29,644.00	
		Sub-Total				₹ 4,233,345.00	

12/10/21  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.



## Bill of Quantity for 7.5 MLD Pump House Super Structure

	Items	No	Length	Width	Height	Quantity	unit		
1	RCC M/S	footing	4	0.8	0.8	0.5	1.280		
		column	8	0.3	0.3	8.2	5.904		
		below cable trench Foundation	1	20	1	0.15	3.000		
		tie & roof beam	16	4.8	0.3	0.3	6.912		
		roof	1	4.8	4.8	0.125	2.880		
		Ramp tie beam	1	4	0.3	0.3	0.360		
							20.336		
					Say	21.000	cum		
2	Steel (Fe 500)	1% of conc. Vol.	1	21.000	of	1.2%	1.9782		
						Say	2.000	MT	
3	Shuttering work reservoir (basement)	footing (without staging)	4	1.2	1.2	0.5	9.600		
			4	0.8	0.8	0.1	1.280		
		cable trench	1	20	1	0.1	4.200		
							15.080		
							Say	16.000	sq.m
		column (steel or ply)	8	0.3	0.3	8.2	78.720		
		tie & roof beam	16	4.8	0.3	0.3	69.120		
roof	1	4.8	4.8	-	23.040				
side of roof	1	19.2	0.125	-	2.400				
Ramp	1	4	0.3	0.3	0.360				
						173.640			
						Say	174.000	sq.m	
4	Brick work (1:4)	Roof	4	4.8	0.25	1.2	5.760		
		cable trench	1	20	1	0.25	5.000		
							10.760		
							Say	11.000	cum
		super str. (extra 10% for inner wall)	4	4.8	0.25	5.7	30.096		
		deduct for shutter opening	1	2.5	2.5	0.25	-1.563		
						28.534			
						Say	29.000	cum	
5	20mm plaster (1:4)	plinth wall	4	4.8	1.2	-	23.040		
		super str. Wall	4	4.8	5.7	-	109.440		



							112.00	
						Say	112.00	sq.m
	17mm plaster (1.4)	cable trench wall	2	20	1	-	105.00	
		super on Wall	4	4.8	1.7	-	105.00	
							105.00	
						Say	110.00	sq.m
	17mm plaster (1.4)	cable trench wall	4	4.8	1.7	-	105.00	
							105.00	
						Say	110.00	sq.m



### Construction Cost of 7.5 MLD Pump House

Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	RCC	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes.	21.00	cu-mtr	₹ 6,053.05	₹ 127,114.08	Building Works SOR 2017; Vol I, p-32 item-18(ii), 3rd corrigenda, Rate analysis
2	Shuttering	Hire & labour charges for shuttering with centring and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work (Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)					PWD SOR-2017 Vol-I, Page no. 42-43, item-36 (c,f)
		(a) 25 mm to 30 mm shuttering without staging in foundation					
		i) In foundation & ground floor	16.00	Sq-mtr	₹ 209.00	₹ 3,344.00	
		(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work					
		ii) In ground floor	174.00	Sq-mtr	₹ 368.00	₹ 64,032.00	
3	Reinforcement	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc. including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) For steel/Mild Steel i) SAIL / TATA / RINL.					Building Work SOR 2017 Vol-I, Page no. 15, item -7(a), 3rd corrigenda
		(a) For works in foundation, basement and upto roof of ground	2.00	M.T	₹ 60,443.00	₹ 120,886.00	

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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference	
		floor/upto 4 m						
		Brick work with 1st class bricks in cement mortar (1:4)						
4	Brickwork	a) In foundation & plinth	11.00	cu-mtr	₹ 5,560.00	₹ 61,160.00		
		b) In superstructure 1st floor.	29.00	cu-mtr	₹ 5,783.00	₹ 167,707.00		
5	Plastering	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface]					Building Work SOR 2017 Vol-I , Page no. 189 item-1(ii) a, b,c 3rd corrigenda	
		i) With 1:4 cement mortar. a) 20 mm thick plaster ( internal )						
		i) In ground floor	133.00	sq-mtr	₹ 185.00	₹ 24,605.00		
				b) 15 mm thick plaster (external)				
				i) In ground floor	150.00	sq-mtr	₹ 160.00	₹ 24,000.00
				c) 10 mm thick plaster (external)				
		i) In ground floor	110.00	sq-mtr	₹ 129.00	₹ 14,190.00	Building Work SOR 2017 Vol-I , Page no. 192, item-15	
6	Stone flooring	Artificial stone in floor, dado, staircase etc. with cement concrete (1:2:4) with stone chips, laid in panels as directed with topping made with ordinary/white cement(as necessary) and marble dust in proportion (1:2) including smooth finishing and rounding off corners and including application of cement slurry before flooring works, using cement @ 1.75Kg/sqm all complete including all materials and labour.	172.00	Sq-mtr	₹ 320.00	₹ 55,040.00	Building Work SOR 2017 Vol-I , Pg-106, It-18	

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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		In ground floor 3mm thick topping (High polishing grinding on this item is not permitted with ordinary cement). Using Grey cement i) 35mm thick. a) In ground floor					
7	Neat cement	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills, floor, drain etc. NOTE : Cement 0.152 cu.m. per 100 sq.m.	130.80	sq-mtr	₹ 34.00	₹ 4,447.20	Building Work SoR 2017 Vol-I, Page no. 106, item-19, 3rd corrigendum 04.06 2018
8	Gate	Collapsible gate with 40mm x 40mm x 6mm Tee as top and bottom guide rail, 20mm x 10mm x 2mm vertical channels 100mm apart in fully stretched position 20mm x 5mm M.S. flats as collapsible bracings properly rivetted and washered including 38mm steel rollers including locking arrangements, fitted and fixed in position with lugs set in cement concrete and including cutting necessary holes, chasing etc. in walls, floors etc. and making good damages complete.	4.00	sq-mtr	₹ 3,402.00	₹ 13,608.00	Building works SoR -2017, Pg-99/ It-1(III), with 3rd corrigendum 04.06 2018
9	Steel roller shutter gate	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G. of approved type steel latch section 75mm wide, fitted with coil wire spring to necessitate the fitting of required Nos. of C.I. Pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially built up side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminium paint over a coat of red lead primer complete.	6.25	sq-mtr	₹ 3,270.00	₹ 20,437.50	
10	MS structural works	M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)- 1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816- 1969 & IS: 1995 using electrodes of approved make and brand conforming to IS:814- 2004, haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental charges such as electricity charges, labour insurance charges etc. Payment to be made on the basis					Building Works SoR -2017, Pg-200 / It-1 (a)

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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		of calculated weight of structural members only in finished work as per IS specified weight.					
		For built up sections / structural members of specified sections weighing not less than 22.5 Kg./m	0.50	MT	₹ 75,266.00	₹ 37,633.00	Building Works SOR -2017, Pg-200 / It-2 (b)(iv)
11	Prime coat	Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	10.000	cu-mtr	₹ 29.00	₹ 290.00	Building works SOR -2017, Pg-196 / It-8 (b)]
12	Enamel painting	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary : (a) On steel or other metal surface : With super gloss (hi-gloss) - (i) Two coats (with any shade except white)	10.000	cu-mtr	₹ 79.00	₹ 790.00	Building Work SOR -2017, Pg-197 / It-17 (a)]
13	Acrylic painting	Applying Exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface old or new surface to receive decorative textured (matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface throughly, complete. (a) One Coat :- (i) In ground floor.	150.000	%Sq-mtr	₹ 4,510.00	₹ 6,765.00	Building Work SOR -2017, Pg-194 / It-4 (i)(b)
14	Decorative Acrylic exterior emulsion	Protective and Decorative Acrylic exterior emulsion paint of approved quality, as per manufacturer's specification and as per direction of Engineer-in-Charge to be applied over acrylic primer as required. The rate includes cost of material, labour, scaffolding and all incidental charges but excluding the cost of primer. In Ground floor (Two Coat). (i) In ground floor	150.000	sq-mtr	₹ 67.00	₹ 10,050.00	Building Work SOR 2017 Vol-I, Page no. 12, item-13
15	Color washing	Colour washing with any shade with Stainers, as required including cleaning and smoothening surface thoroughly: (i) Internal surface (All floors) (b) Two coats (on new works only). (i) Other than yellow, pink. (i) In ground floor	243.000	%sq-mtr	₹ 2,046.00	₹ 4,971.78	S&D Works SOR 2018-2019,pg-19, item -23
16	Removal of Rubbish	Removal of rubbish,earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning	50.000	cu-mtr	₹ 166.00	₹ 8,300.00	Building Work SOR 2017 Vol-I, Page no. 212-213.



Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		the site in all respect as per direction of Engineer in charge					item-21 a (i)
17	Catch-pit	Constructing catch pit to a depth of 1.0m (Inside) with 250mm th. 1st class Brick Work (1:4) in all sides over a layer of jhama brick soling & 100mm th. jhama cement concrete (1:4:8) including necessary earth work, providing approved type C.I. Syphone (150mm dia) with topping RCPC gully grid (SMT load bearing capacity) constructing invert with brick-on-edge, including 20mm th. inside cement plaster (1:4) finished with neat cement punning, at the top 100mm th. R.C.C. slab (1:1.5:3) with stone chips including necessary reinforcement, shuttering as per standard drawing and as directed by E-I-C complete in all respect and removal of surplus earth with all costs of labour and materials. Inside measurement of catch pit, 600mm x 525mm	1.000	Each	₹ 12,175.00	₹ 12,175.00	Building Work SOR 2017 Vol-1, Page no. 107, ITEM -20 b
20	Rain Water Pipe	Supplying, fitting & fixing UPVC pipes A- Type and fittings conforming to IS:13592-1992 with all necessary clamps nails, including making holes in walls, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/Bitumen/M-Seal etc) complete. A) UPVC Pipes: (i) 75 mm. Dia.	5.000	m	₹ 188.00	₹ 940.00	Building Work SOR 2017 Vol-1, Page no. 108, ITEM -20(c) i
21	Windows & Ventilators	Supplying, fitting and fixing windows and ventilators with or without integrated grills conforming to IS 1038-1975 and manufactured from rolled steel sections conforming to IS 7452-1974 with non-friction projecting type, box type hinges, glazing clips, lugs locking bracket, handle plate etc, including hoisting in position, straightening if required, fixing lugs in cement concrete (1:2:4) with stone chips 20 mm down cutting holes and mending good damages to match with existing surface complete in all respect excluding glazing. (b) Openable steel windows as per IS sizes with side hung shutters and horizontal glazing bars. [The extra rate admissible for the openable portion only]	5.4	sq-mtr	₹ 1,663.00	₹ 8,980.20	Building Work SOR 2017 Vol-1, Page no. 108-109, ITEM-21(b)
		(i) Fixed type ventilators as per I.S. sizes with horizontal glazing bars height being limited to 580 mm.	0.27	sq-mtr	₹ 107.00	₹ 28.89	
19	window glass	Supplying and affixing optically clear polyester sun control window film having acrylic pressure sensitive adhesive on one side & an acrylic abrasion resistant coating on the other, with composition of					Building Work SOR 2017 Vol-1, Page no. 206,



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Sl. No.	Item	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
		infrared absorbing carbon & free from any optical defect. The film characteristics should conform to ASTM E308, ASTM E903, ASTM E84 and ASHRAE. The film should be pasted after preparatory works without any cracking, delamination, bubbling, discolouring and variation in total transmission of light across the width at any portion along the length doesn't exceed 2% over the average including scaffolding & relevant others to complete in all respect as per manufacturer's specification & direction of Engineer-in-Charge. (Note: This work should not be executed without specific permission of Superintending Engineer)					ITEM-8a
		a) Normal Quality : Film Thickness - 1.0 Mil, Glare Reduction > 45%, U factor < 1.15	5.4	Sq.M	₹ 326.00	₹ 1,760.40	
20	roofing	Lime terracing on roof with lime concrete(2:2:7) (2 lime putty / paste : 2 surki : 7 brick khoa ) laid to proper slope, thoroughly beaten and cured including top finishing, providing ghoondies at junction with parapet etc., shaping and finishing at mouths of rain water pipes, complete as per direction.					Building Work SOR 2017 Vol-I, Page no. 78, ITEM-1
		(a) 75 mm. thick (average)	23.04	Sq.M	₹ 544.00	₹ 12,533.76	
22	Staircase	Supplying, fitting and fixing cast iron heavy type spiral staircase of approved design with 50 mm.dia. Stem and C.I. Steps 150 mm as per design 900 mm. high C.I. railing including necessary M.S. tie of suitable section embedded to wall with cement concrete (1:2:4) including cost of intermediate C.I. platform secured with necessary tie to stem and wall with cement concrete (1:2:4) including fixing the stem in ground with cement concrete (1:(1:3:6) complete in all respect with all labour and materials. (Payment to be made on vertical height in between 1st step and top platform.)					Building Work SOR 2017 Vol-I, Page no. 108-109, ITEM-21(b)
		b. With 900 mm.dia. Well	4.5	M	₹ 3,882.00	₹ 17,469.00	
Sub-Total						₹ 823,257.81	



Executive Engineer  
WB-1/ GAP/ w&B Sector,  
K.M.D.A.

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### SOIL INVESTIGATION WORK FOR 7.5 MLD PUMP STATION

S.L. No.	Description Of items	Quantity	Unit	Rate (Rs)	Amount Rs.)	
A	B	C	D	E	F	
1	<p><b>Mobilisation charges</b> of all tools &amp; plants along with accessories, materials, labour, supervision etc. at site of work required in connection with boring &amp; testing work, including setting up boring rigs and shifting to different Bore-hole points etc. and also including withdrawal of same from the site after completion of work, complete as per direction of Engineer-in-Charge.</p> <p>b) Detailed investigation.</p> <p>Note payment will be made after successful completion of the work [Ref.: PWD(R &amp; B WORKS)/2018/P323/Item No. 17.01(b)]</p>	1	No.	L. S.	₹ 25,000.00	₹ 25,000.00
2	<p>Labour for <b>making Bore-Holes</b> of 150 mm to 250 mm dia. by any standard method to any depth below ground level/bed level in all kinds (for the purpose of collecting Disturbed and Undisturbed soil samples, conducting Standard Penetration Test at suitable intervals etc.) including preparation and submission of bore-log as per IRC: 75 and 78 and Clause 2400 of Specification for Road &amp; Bridge Works (5th Revision), published IRC and also including hire charges of tools &amp; plants complete as per the direction of Engineer-in-Charge Revision), published IRC and also including hire charges of tools &amp; plants complete as per the direction of Engineer-in-Charge.</p> <p>a) When casing pipe is used to prevent collapse of borehole (casing pipe to be finally withdrawn)</p> <p>(i) Depth 0 m to 10 m</p> <p>(i) Depth 10 m to 20 m</p> <p>(i) Depth 20 m to 30 m</p> <p>[Ref.: PWD(R &amp; B WORKS)/2018/P323 / Item No. 17.04 (a)(i,ii,iii)]</p>	10	m	m	₹ 340.00	₹ 3,400.00
		10	m	m	₹ 400.00	₹ 4,000.00
		10	m	m	₹ 470.00	₹ 4,700.00
3a	FIELD INVESTIGATION :					
i)	Collection of Undisturbed soil sample from the bore hole to be made by the concerned Division / Party at their cost					
	(i) Depth 0.0m - 10.0m	1	Nos.	each	₹ 230.00	₹ 230.00
	(i) Depth 10 m to 20 m	1	Nos.	m	₹ 350.00	₹ 350.00

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S.L. No.	Description Of items	Quantity	Unit	Rate (Rs)	Amount Rs.)
A	B	C	D	E	F
	[Ref.: PWD(R & B WORKS)/2018/P326/Item No. 17.05 B(v)(i to iii)]				
ii)	Standard Penetration Tests (S.P.T.) by Split Spoon Sampler in the bore hole as per IS 2131.				
	(i) Depth 0.0m - 10.0m	3 Nos.	each	₹ 350.00	₹ 1,050.00
	(i) Depth 10 m to 20 m	3 Nos.	m	₹ 460.00	₹ 1,380.00
	(i) Depth 20 m to 30 m	3 Nos.	m	₹ 570.00	₹ 1,710.00
	[Ref.: PWD(R & B WORKS)/2018/P326/Item No.17.05 B(vi)(i)]				
3b	LABORATORY INVESTIGATION :				
i)	Liquid limit as per IS 2720 (Part - V)	1 Nos.	each	₹ 350.00	₹ 350.00
ii)	Plastic Limit as per IS 2720 (Part - V)	1 Nos.	each	₹ 350.00	₹ 350.00
iii)	Grain size analysis by Hydrometer Method as per IS 2720 (Part - IV)	1 Nos.	each	₹ 690.00	₹ 690.00
iv)	Determination of Water Content as per IS 2720 (Part - II)	1 Nos.	each	₹ 140.00	₹ 140.00
v)	Determination of Specific Gravity as per IS 2720 (Part - III)	1 Nos.	each	₹ 460.00	₹ 460.00
vi)	Determination of Unconfined Compression Strength as per IS 2720 (Part - X)				
	a) Undisturbed	1 Nos.	each	₹ 690.00	₹ 690.00
vii)	Determination of Consolidation Properties as per IS 2720 (Part - XIV)	1 Nos.	each	₹ 920.00	₹ 920.00
viii)	Tri-Axial Shear Test.				
	a) Determination of Shear Strength Parameters of a specimen tested in Unconsolidated Undrained Tri-axial compression without measurement of pore water pressure as per IS 2720 (Part - XI)	1 Nos.	each	₹ 920.00	₹ 920.00
	[Ref.: PWD(R & B WORKS)/2018/P324-325/Item No. 17.05 A (i)(ii) (iv)(v)(vi)(viii a)(xiv)(xvi a)]				
4	Carriage of all Disturbed & Undisturbed Samples from site of work to the Divisional Office or elsewhere including loading and unloading as per direction of Engineer-in-Charge. <b>Detailed Investigation.</b>	1 No.	L. S.	₹ 1,600.00	₹ 1,600.00



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S.L. No.	Description Of Items	Quantity	Unit	Rate (Rs)	Amount Rs.)
A	B	C	D	E	F
	[ Ref: PWD(R & B WORKS)/2018/P-323/Item No. 17.02 ]				
5	Preparation and submission of report in 6(Six) copies giving all relevant information data like site plan, bore log and water table, test results, calculations, discussions, suggestions & recommendations in respect of suitable foundation etc. including determination of silt factor calculation of waterways and complete design of foundation including analysis of Bearing Capacities and Settlements in bound and presentable from complete as per direction of Engineer-in-Charge				
b)	Detailed Investigation [ Ref: PWD(R & B WORKS)/2018/P330/Item No. 17.08 (b) ]	1	No.	₹ 12,500.00	₹ 12,500.00
				Total : *	₹ 60,440.00

  
 Executive Engineer  
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 K.M.D.A.



1000

## Bill of Quantity for Electrical Switch room for 7.5 MLD LS

	Items		No	Length	Width	Height	Quantity	unit
1	Earthwork in excavatoin	upto 1500 depth	4	1.2	1.2	1.5	8 640	
						Say	10.000	cum
		1500 to 3000 depth	4	1.2	1.2	1.0	5 760	
						Say	6.000	cum
2	Earthwork in filling	upto 1500 depth	1	7.200	of	75%	5 400	
						Say	10.000	cum
3	Sand filling	in Foundation	4	1.2	1.2	0.3	1 728	
		in plinth	1	5	5	0.4	10.000	
		in ramp & stair	1	5	1.5	0.4	1 500	
							13 228	
						Say	15.000	cum
5	Shoring works	upto 1500 depth	4	1.2	1.2	1.5	28 800	sq.m
		1500 to 3000 depth	4	1.2	1.2	1.0	19 200	sq.m
6	Brick Flat Soling	Foundation	4	1.2	1.2	-	5 760	
		floor	1	5	5	-	25.000	
		ramp & stair	1	5	1.5	-	7 500	
							38 260	
						Say	40.000	sq.m
7	PCC (1:2:4)	Foundation	4	1	1	0.1	0.400	
		floor	1	5	5	0.1	2 500	
		below cable trench Foundation	1	5	1.6	0.1	0 800	
		ramp & stair	1	5	1.5	0.1	0 750	
							4 450	
						Say	5.000	cum
8	RCC M25	footing	4	0.8	0.8	0.5	1 280	
		column	4	0.25	0.25	6.1	1 525	
		below cable trench Foundation	1	5	1.6	0.1	0 800	
		tie & roof beam	3	20	0.3	0.3	5 400	
		roof	1	5	5	0.125	3 125	
		ramp tie beam	1	5	0.3	0.25	0 375	
							12 505	
						Say	14.000	cum
9	Steel (Fe 500)	1% of conc. Vol.	1	14.000	of	1.2%	1 3188	
						Say	1.300	MT
10	Shuttering work reservoir (basement)	footing (without staging)	4	1.2	1.2	0.1	1 920	
			4	0.8	0.8	0.1	1 280	



Items	Description	No	Length	Width	Height	Quantity	Unit		
	cable trench	1	5	1.5	0.1	1.175			
						4.575			
						Say	5.000	sq.m	
		column (also for ply)	4	0.25	0.25	6.1	21.400		
			tie & roof beam	1	20	0.1	0.1	18.000	
			roof	1	5	5		25.000	
			side of roof	1	20	0.15		1.000	
			ramp tie beam	1	5	0.1	0.25	4.250	
							74.650		
							Say	75.000	sq.m
11	Brick work (1:4)	Foundation & plinth	4	5	0.1	0.25	1.500		
		cable trench	1	5	0.1	0.25	0.375		
							1.875		
							Say	5.000	cum
		super str	4	5	3	0.25	15.000		
		deduct for shutter opening	1	3	2	0.25	-1.500		
					13.500				
					Say	15.000	cum		
12	20mm plaster (1:4)	plinth wall	4	5	0.3	-	6.000		
		super str. Wall	4	5	5	-	100.000		
							106.000		
							Say	110.000	sq.m
	15mm plaster (1:4)	cable trench wall	1	5	1.2	-	6.000		
		super str. Wall	4	5	3	-	60.000		
							66.000		
							Say	70.000	sq.m
	10mm plaster (1:4)	cable trench wall	1	5	1.2	-	6.000		
							6.000		
							Say	10.000	sq.m



### Construction of Electrical Switch room for 7.5 MLD LS

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. a) Depth of excavation not exceeding 1,500 mm.	10.00	% cu-mtr	₹ 11,927.00	₹ 1,192.70	Building Work SOR 2017 Vol-I, Page no. 1 item-2(a,b,c)
	b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm.	6.00	% cu-mtr	₹ 19,238.00	₹ 1,154.28	
2	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) a) With earth obtained from excavation of foundation.	10.00	% cu-mtr	₹ 7,754.00	₹ 775.40	Building Work SOR 2017 Vol-I, Page no. 1 item-3(a)
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity)	15.00	% cu-mtr	₹ 71,181.00	₹ 10,677.15	Building Work SOR 2017 Vol-I, Page no. 2 item-4(a)
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus /Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Engineer in charge) (i) For basement work and Depth upto 1.50 m.	28.80	sq-mtr	₹ 386.00	₹ 11,116.80	Building Works SOR 2017, Vol I, p-3 item-6(a,b,c)
	(ii) For basement work and Depth beyond 1.50 m and upto 3.00 m.	19.20	sq-mtr	₹ 439.00	₹ 8,428.80	
5	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	40.00	sq-mtr	₹ 357.00	₹ 14,280.00	PWD Building SOR 2017 Vol-I, Page no. 14, item -1, 3rd Corringenda
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety, i) Ground Floor	5.00	cu-mtr	₹ 5,506.62	₹ 27,533.12	Building Work SOR 2017 Vol-I, Rate Analysis
7	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on	14.00	cu-mtr	₹ 7,575.51	₹ 106,057.18	Building Works SOR 2017 Vol-I, Rate Analysis



1003



Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation. i) With approved concrete pump.					
8	Hire & labour charges for shuttering with centring and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work. (Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (c) for every 4 m or part thereof)					PwD Building work SOR - 2017, P-36/42(c)(f)
	(a) 25 mm to 30 mm shuttering without staging in foundation					
	i) In foundation & ground floor	5.00	Sq-mtr	₹ 209.00	₹ 1,045.00	
	(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work					
	ii) In ground floor	75.00	Sq-mtr	₹ 369.00	₹ 27,675.00	
9	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc. including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) For steel/Mild Steel i) SAIL / TATA / RINL.					Building Works-SOR 2017, P-44, Item 40 (a)(i). 10th CORRIGENDA
	(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	1.30	M.T	₹ 60,443.00	₹ 78,575.90	
10	Brick work with 1st class bricks in cement mortar (1:4)					Building Work SOR 2017 Vol-I, Page no. 15, item - 7(a), 3rd corrigenda
	a) In foundation & plinth	5.00	cu-mtr	₹ 5,560.00	₹ 27,800.00	
	b) In superstructure 1st floor.	15.00	cu-mtr	₹ 5,783.00	₹ 86,745.00	
11	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface]					Building Work SOR 2017 Vol-I, Page no. 189 item-1(ii) a, b, c, 3rd corrigenda

1001

1005



Sl. No	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	i) With 1:4 cement mortar. a) 20 mm thick plaster ( internal )					
	i) In ground floor	110.00	sq-mtr	₹ 185.00	₹ 20,350.00	
	b) 15 mm thick plaster (external)					
	i) In ground floor	70.00	sq-mtr	₹ 160.00	₹ 11,200.00	
	c) 10 mm thick plaster (external)					
	i) In ground floor	10.00	sq-mtr	₹ 129.00	₹ 1,290.00	
12	Artificial stone in floor, dado, staircase etc. with cement concrete (1:2:4) with stone chips, laid in panels as directed with topping made with ordinary/white cement(as necessary) and marble dust in proportion (1:2) including smooth finishing and rounding off corners and including application of cement slurry before flooring works, using cement @ 1.75Kg/sqm all complete including all materials and labour. In ground floor 3mm thick topping (High polishing grinding on this item is not permitted with ordinary cement.). Using Grey cement i) 35mm thick. a) In ground floor	86.00	Sq-mtr	₹ 337.00	₹ 28,982.00	Building Work SOR 2017 Vol-I, P-48, Item- 6(iii)
13	Neat cement punning about 15 mm. thick in wall, dado, window, sills, floor, drain etc. NOTE: Cement 0.152 cu.m. per 100 sq.m.	65.40	sq-mtr	₹ 34.00	₹ 2,223.60	Building Work SOR 2017 Vol-I, P-192, Item- 15
14	Collapsible gate with 40mm x 40mm x 6mm Tee as top and bottom guide rail, 20mm x 10mm x 2mm vertical channels 100mm apart in fully stretched position 20mm x 5mm M.S. flats as collapsible bracings properly rivetted and washered including 38mm steel rollers including locking arrangements, fitted and fixed in position with lugs set in cement concrete and including cutting necessary holes, chasing etc. in walls, floors etc. and making good damages complete.	2.00	sq-mtr	₹ 4,330.00	₹ 8,660.00	Building Work SOR 2017 Vol-I, Pg-106, It-18 with 3rd corrigendam
15	Supplying, fitting and fixing steel rolling shutter profile type with 18 B.G. of approved type steel latch section 75mm wide, fitted with coil wire spring to necessitate the fitting of required Nos. of C.I. Pulleys on heavy type solid drawn seamless steel tube complete with locking arrangements both inside and outside specially builtup side guide channels including providing a hood for the steel rolling shutter in the room, painting two coats of approved aluminium paint over a coat of red lead primer complete.	36.00	sq-mtr	₹ 3,270.00	₹ 117,720.00	Building Work SOR 2017 Vol-I, Pg-106, It-19 with 3rd corrigendam
16	M.S. structural works in columns, beams etc. with simple rolled structural members (e.g. joists, angle, channel sections conforming to IS: 226, IS: 808 & SP (6)- 1964 connected to one another with bracket, gussets, cleats as per design, direction of Engineer-in-charge complete including cutting to requisite shape and length, fabrication with necessary bolting, metal arc welding conforming to IS: 816- 1969 &					Building works SOR - 2017, Pg-99/ It-1(III), with 3rd corrigendam

Sl. No	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
	IS. 1995 using electrodes of approved make and brand conforming to IS.814- 2004. haulage, hoisting and erection all complete. The rate includes the cost of rolled steel section, consumables such as electrodes, gas and hire charge of all tools and plants and labour required for the work including all incidental chages such as electricity charges, labour insurance charges etc. Payment to be made on the basis of calculated weight of structural members only in finished work as per IS specified weight.					
	For built up sections / structural members of specified sections weighing not less than 22.5 Kg/m	0.50	MT	₹ 75,266.00	₹ 37,633.00	
17	Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	10.000	cu-mtr	₹ 29.00	₹ 290.00	Building Works SOR - 2017, Pg-200 / It-1 (a)
18	Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary: (a) On steel or other metal surface: With super gloss (hi-gloss) (i) Two coats (with any shade except white)	10.000	cu-mtr	₹ 79.00	₹ 790.00	Building Works SOR - 2017, Pg-200, It-a(iv)
19	Applying Exterior grade Acrylic primer of approved quality and brand on plastered or concrete surface old or new surface to receive decorative textured (matt finish) or smooth finish acrylic exterior emulsion paint including scraping and preparing the surface thoroughly, complete. (a) One Coat :- (i) In ground floor.	70.000	%Sq-mtr	₹ 4,510.00	₹ 3,157.00	Building Works SOR - 2017, Pg-196, It-8 (b)
20	Protective and Decorative Acrylic exterior emulsion paint of approved quality, as per manufacturer's specification and as per direction of Engineer-in-Charge to be applied over acrylic primer as required. The rate includes cost of material, labour, scaffolding and all incidental charges but excluding the cost of primer. In Ground floor (Two Coat). (a) Normal Acrylic Emulsion. (i) In ground floor	70.000	sq-mtr	₹ 67.00	₹ 4,690.00	Building Works SOR - 2017, Pg-196, It-8 (b)]
21	Colour washing with any shade with Stainers, as required including cleaning and smoothening surface thoroughly : (i) Internal surface (All floors) (b) Two coats (on new works only). (i) Other than yellow, pink. (i) In ground floor	120.000	%sq-mtr	₹ 2,046.00	₹ 2,455.20	Building Works SOR - 2017, Pg-196 / It-8 (b)
22	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	50.000	cu-mtr	₹ 166.00	₹ 8,300.00	Building Works SOR - 2017, P-12, item-13
Sub-Total					₹ 650,798.00	



  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.

### Estimate for Construction of Boundary Wall 2.0m Height at 7.5 MLD Pump House

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete (a) Depth of excavation not exceeding 1500 mm (b) Depth of excavation for additional depth beyond 1,500 mm and upto 3,000 mm but not requiring shoring. PWD's ( Bldg ) -2017, Pg-1 / It-2 (a),(b)	162.750 35.263	%Cum %Cum	11927.00 19238.00	19411.19 6783.80
2	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work). (a) With earth obtained from excavation of foundation It. No. 3(a), Page-1 of PWD (B)-2017	148.509	%Cum	7754.00	11515.42
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) PWD's ( Bldg ) Schedule of Rates-2017, Pg-2 / It-4(A)	16.275	%Cum	71181.00	11584.71
4	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand PWD's ( Bldg ) -2017, Pg-14 / It-1 with 3rd corrigendum 04-06-2018	93.000	Sq M	357.00	33201.00
5	Supplying and laying Polythene Sheet (150gm / sq m) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches. P-47/3-Pwd(B)-2017	93.000	Sq M	24.00	2232.00



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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety PWD's ( Bldg ) -2017, Pg-24 / It-4(a), with 3rd corrigendam 04.06.2018, rate analysis.	8.000	Cu.M	5506.62	44053.00
7	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. (i) Pakur Variety PWD's ( Bldg ) -2017, Pg-26 / It-10(i), with 3rd corrigendam 04.06.2018, rate analysis.	30.000	Cu.M	6053.05	181591.54
8	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. (a) For works in foundation, basement and upto roof of ground floor/upto 4 m A) Tor steel/Mild Steel i) SAIL / TATA / RINL. PWD's ( Bldg ) -2017, Pg-43 / It-40(a), with 3rd corrigendam 04.06.2018	3.540	M.T.	60433.00	213932.82
9	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)				
	(a) 25 mm to 30 mm thick wooden shuttering as per decision & direction of Engineer-In-Charge.	111.000	Sq.m	209.00	23199.00
	b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work.	126.000	Sq.m	369.00	46494.00
	PWD's ( Bldg ) Schedule of Rates-2017. Pg- 42 / It-36 (c)(f)				
10	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) i) In ground floor	119.00	Sq.M	722.00	85918.00

800)

1003



Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	PWD's ( Bldg ) -2017, Pg-16 / It-16, with 3rd corrigendam 04.06.2018				
11	Plaster (to wall, floor, ceiling etc ) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding / staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface] With 1:4 cement mortar (i) 15 mm thick plaster.	384.000	Sq.M	160.00	61440.00
	PWD's ( Bldg )-2017, Pg-189/It-1(ii)(b) with 3rd corrigendam 04.06.2018				
12	Cement washing including cleaning and smoothening surface thoroughly (cement to be used @15 kg/100 sq.m. of surface for one coat and @25 kg/100 sq.m of surface for two coats): External surface (i) In ground floor (Two coats on new works only). P-195/5(b) of PWDSOR(B) - 2017.	384.000	%sq.m	1424.00	5468.16
	P-197/15(iii) of PWDSOR(B) - 2017.				
13	Applying decorative cement based paint of approved quality after preparing the surface including scraping the same thoroughly (plastered or concrete surface) as per manufacturer's specification. (i) In ground floor (Two coats on new works only).	384.000	Sq.M	49.00	18816.00
	P-197/15(iii) of PWDSOR(B) - 2017.				
14	M.S. gate of Jail type as per approved design made of strong M.S. frame work, intermediate stiffeners and round /square bars or angles, M.S. sheet (not less than 14 gauge) gussets, cleats etc. including necessary riveting, bolting, welding, locking and hanging arrangements, fitting and fixing complete as per direction of the Engineer-in-charge (a) In ground floor.	12.000	qntl.	10090.00	121080.00
	PWD's ( Bldg ) -2017, Pg-105 / It-16, with 3rd corrigenda.				
Total = Rs.					886,720.64
Say Rs.					886,721.00

**Estimate for Construction of Storm Water Drain of 7.5 MLD Pump House**

Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m.as directed. The item includes necessary trimming thesides of trenches, levelling, dressing and ramming thebottom, bailing out water as required complete.	42.00	%cum	11927.00	5009.34

Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	a) Depth of excavation not exceeding 1,500 mm.				
	PWD's ( Bldg ) -2017, Pg-1 / It-2 (a)				
2	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured. (This item should be executed on specific direction of the Enginner in charge)				
	(a) Depth upto 1.5 m.	52.00	sq.m	386.00	20072.00
	It. No. 6(a)(b)(c) Page-3 of PWD (B)-2017				
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity)	10.00	%Cum.	71181.00	7118.10
	PWD's ( Bldg ) Schedule of Rates-2017, Pg-2 / It-4(A)				
4	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	46.00	Sq.m.	357.00	16422.00
	PWD's ( Bldg ) -2017, Pg-14 / It-1 with 3rd corrigendam 04.06.2018				
5	Supplying and laying Polythene Sheet (150gm / sq.m.) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches.	46.00	Sq.m.	24.00	1104.00
	(Ref: Item-3, Page-47, P.W.D.(Build) 2017				
6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. Pakur Variety	5.00	Cum.	5506.62	27533.12
	PWD's ( Bldg ) -2017, Pg-24 / It-4(a), with 3rd corrigendam 04.06.2018, rate analysis.				
7	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)				
	(a) 25 mm to 30 mm shuttering without staging in foundation.	16.00	sqm	209.00	3344.00
	PWD's ( Bldg ) Schedule of Rates-2017, Pg- 42 / It-36 (c )(f)				
8	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) i) In ground floor	27.00	Sq.M	722.00	19494.00
	PWD's ( Bldg ) -2017, Pg-16 / It-16. with 3rd corrigendam 04.06.2018				
9	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as				

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Sl. No.	Description of Item	Quantity	Unit	Rate (Rs.)	Amount (Rs.)
	directed and raking out joints including throating, nosing and drip course, scaffolding / staging where necessary (Ground floor) [Excluding cost of chipping over concrete surface]  With 1:4 cement mortar (i) 15 mm thick plaster  PWD's ( Bldg )-2017, Pg-189/It-1(ii)(b) with 3rd corrigendum 04.06.2018	60.000	Sq.M	160.00	9600.00
10	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills, floor, drain etc.  PwD (Building)-2017, P-192, It-15	73.000	sq-mtr	34.00	2482.00
				Total = Rs.	109696.56
				Say Rs	109,697.00

Executive Engineer  
W.B./GAP/W&B Sector  
K.M.D.A.



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BOQ of Lockgate								
SI No.	Items		No	Length (m)	Width (m)	Height (m)	Quantity	unit
1	Sand filling	in Foundation	1	4	1.5	0.25	1.500	cum
2	BFS (2 layer)	in Foundation	2	4	1.5	-	12.000	sq.m
3	PCC (1:2:4)	300 mm Foundation	1	4	1.5	0.3	1.800	cum
		600 mm resting slab	2	1	0.5	0.6	0.600	cum
4	RCC M25	Footing	1	4	1.5	0.7	4.200	cum
		Guard Wall Column	3	0.5	1.5	3.8	9.000	cum
		Roof slab	1	4	0.5	0.2	1.000	cum
5	Steel (Fe 500)	1% of conc. Vol.	1	14.200	of	1.2%	2	MT
6	Shuttering work	Footing	1	4	1.5	1	11.000	sq.m
		Guard Wall Column	3	0.5	1.5	3.8	45.600	sq.m
		600 mm resting slab	2	1	0.5	0.6	3.600	sq.m
		Roof slab	1	4	0.5	0.2	1.800	sq.m
7	Brick work (1:4)	Side Wall	2	0.25	1.5	3.8	3.000	cum
8	Plastering (1:4)	20mm plaster	4	0.25	1.5	3.8	16.000	sq.m



## COST OF LOCKGATE

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
1	Sand Filling	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity). 150 mm layer (B) Do by fine sand.	₹ 131,714.00	%cum	1.50	₹ 1,975.71	Building Works SOR 2017 page 2, item-4b ,5th CORRIGENDA & ADDENDA
2	BFS	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand. (Double Layer)	₹ 361.00	sqm	12.00	₹ 4,332.00	PWD SOR Vol-I ,2017 Page no. 14 item no 1 3rd corrigenda
3	Shuttering	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor) (a) 25 mm to 30 mm thick wooden shuttering as per decision & direction of Engineer-In-Charge.	₹ 335.00	sqm	62.00	₹ 20,770.00	Building Works SOR Vol-I, 2017 , p-42-43 , item 36a
4	PCC	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. Pakur Variety	₹ 5,530.96	cum	2.40	₹ 13,274.30	Building Work SOR 2017 Vol-I , Rate Analysis
5	RCC	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through	₹ 7,765.01	cum	14.20	₹ 110,263.14	Building Works SOR 2017 Vol-I, Rate Analysis



Sl no	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
6	Reinforcement	separate item [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation i) With approved concrete pump.  Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and bunding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation, basement and upto roof of ground floor upto 4 m For steel/Mild Steel SAIL/ TATA/RINL	₹ 50,500.00	MT	2.00	₹ 101,000.00	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
7	Brickwork	Brick work with 1st class bricks in cement mortar (1:4) for wall	₹ 5,682.02	cum	3.00	₹ 17,046.06	PWD SOR Vol-I, Page no. 15, 3rd corrigenda
8	Plastering	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding staging where necessary (Ground floor) [Excluding cost of chipping over concrete surface] 20mm thick plaster with 1:6 cement mortar	₹ 167.00	sqm	16.00	₹ 2,672.00	Building Work SOR 2017 Vol-I, Page no. 189, item-(ii) a 3rd Corrigenda
9	Punning	Neat cement punning about 1.5mm thick in wall,dado>window sill,floor etc. Cement 0.152 cu.m per100 sq.m.	₹ 34.00	sqm	16.00	₹ 544.00	PWD SOR Vol-I, Page no. 192, item 15
10	Sluice Gates	Supplying, Fixing and installation of Lockgates/ Sluice gate along with all arrangement of Guide channel and Draw shutter as per specified size by engineer-in charge (1m x 2m)	₹ 300,000.00	unit price	2.00	₹ 600,000.00	Market rate
11	Hume Pipes	Supplying, installing of 2nos of RCC - NP4 pipe at site of 1000mm dia including all charges	₹ 8,358.00	mt	20.00	₹ 334,320.00	PWD, SOR Vol-III, Page no. 223, item-8(f) and p-283 i-11.06
12	Handrail	Supplying, fitting and fixing Stainless Steel railing consist of 38mm dia and 900mm height vertical balustrade at every two alternative steps, 50mm dia top rail, 3 (three) nos 19mm dia horizontal Strainless steel pipe and base/cover plate with Strainless Steel GRADE 304 containing 7.5% nickle (Interior Grade) Brushed/Mat	₹ 5,974.00	mt	22.00	₹ 262,856.00	PWD SOR Vol-I, Page no. 109, item: 22



Sl. No.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		Work complete as per direction of the Engineer-in-charge. Weight of Stainless Steel railing per metre 6.5 Kg (approx)				₹ 1,469.0122	
		1171.81					

### Estimate of Approach Road for 7.5 MLD Pump House

Executive Engineer  
W-3-I/GAP/W&B Sector,  
K.M.D.A.

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
1	Earthwork in excavation for foundation of structures upto 3 m depth as per drawing and technical specification (Clause 1104 for Rural Roads of MUKG) including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material	29.25	%cum	11927.00	3,488.65	Building Work SOR 2017 Vol-1 Page no. 1 item-2(a,b,c)
2	Filling in foundation or piths by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity by ramming wherever necessary)	16.25	%cum	71181.00	11,566.91	Building Work SOR 2017 Vol-1, Page no. 2 item-4(a)
3	Supplying and laying Polythene Sheet (150gm / sq m) over damp proof course or below flooring or roof terracing or in foundation or in foundation trenches	65.00	sq.m	24.00	1,560.00	PWD B-2017, Pt-1 P-47
4	Supplying and laying of picked (hama) bricks including ramming and dressing bed to proper level and filling joints with local sand	65.00	Sq.m	357.00	23,205.00	PWD B-2017 Pg-2, It-4(A)
5	Form and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, (interior, curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor)					Pwd Building work SOR -2017, P-36-42 (c)(f)
6	(b) steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work	3.90	sq.m	369.00	1,439.10	

9/06

6	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety	6.50	cum	5506.62	35,793.06	Building Work SOR 2017 Vol-I, Rate Analysis
7	Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement if any, in ground floor as per relevant IS codes. a) Pakur Variety	9.75	sq.m	6053.05	59,017.25	Building PWD SOR-2017, It-10(i), P-26, rate analysis
8	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL. (a) For works in foundation and upto roof of ground floor/upto 4 m.	0.92	MT	60443.00	55,513.87	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
9	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	27.79	cum	166.00	4,612.73	Building SOR PWD-2017, It-13, P-12
Sub-Total					₹ 196,197.00	



### Construction of Septic Tank

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
1	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	10.00	sq-mtr	₹ 361.00	₹ 3,610.00	Building Works SOR 2017 Vol-I, Rate Analysis

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
2	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety i) Ground Floor	5.00	cu-mtr	₹ 5,530.96	₹ 27,654.80	Building Works SOR 2017 Vol-I, Rate Analysis
3	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, i) With approved concrete pump.	0.79	cu-mtr	₹ 7,765.01	₹ 6,146.01	
4	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work .(Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)  (a) 25 mm to 30 mm shuttering without staging in found at ionaging i) In foundation & ground floor					Pwd Building work SOR - 2017, P-36/42(c)(f)
		10.00	Sq-mtr	₹ 209.00	₹ 2,090.00	
5	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, i)	0.79	cum	₹ 7,765.01	₹ 6,146.01	Pwd Building work SOR - 2017, P-36/42(c)(f)

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
	With approved concrete pump.					
6	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, bindees etc. including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL.					
	(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	0.10	M.T	₹ 60,433.00	₹ 6,043.30	Building Work SOR 2017 Vol-I . Page no. 15. item -7(a), 3rd corrigenda
7	Brick work with 1st class bricks in cement mortar (1:4)					
	a) In foundation & plinth	5.00	cu-mtr	₹ 5,483.00	₹ 27,415.00	Building Work SOR 2017 Vol-I . Page no. 15. item -7(a), 3rd corrigenda
8	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	2.40	sq-mtr	₹ 714.00	₹ 1,713.60	Building Work SOR 2017 Vol-I . Page no. 189 item-1(i) a, b,c, 3rd

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Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
						corrigenda
9	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface]					
	a) 25 mm thick plaster (i) With 1:6 cement mortar. external )	50.00	sq-mtr	₹ 187.00	₹ 9,350.00	
	i) In ground floor					
10	Neat cement punning about 1.5mm thick in wall, dado, window sill, floor etc. NOTE: Cement 0.152 cu.m per 100 sq.m.	40.00	sq-mtr	₹ 34.00	₹ 1,360.00	Building Work SOR 2017 Vol-I . Page no. 192 item-15
11	Supplying, fitting & fixing UPVC pipes A- Type and fittings conforming to IS:13592-1992 with all necessary clamps nails, including making holes in walls, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/Bitumen/M-Seal etc) complete. A) UPVC Pipes: (i) 75 mm. Dia.	4.00	per/metre	₹ 118.00	₹ 472.00	Building Work SOR 2017 Vol-I . Page no. 212 item-A/(i)
	a) Plain Tee (i) 75 mm. Dia.	2.00	Each	₹ 102.00	₹ 204.00	Building Work SOR 2017 Vol-I . Page no. 212 item-a/(i)

Sl. No.	Description of Works	Quantity	Unit	Rate (Rs.)	Amount (Rs.)	SoR Reference
				Sub-Total	₹ 92,204.71	

### Construction of TOILET

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	10.00	sq-mtr	₹ 714.00	₹ 7,140.00	Building Work SOR 2017 Vol-1 , Page no. 16 item-16
2	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface]	10.00	sq-mtr			Building Work SOR 2017 Vol-1 , Page no. 189 item-1
	i) With 1:6 cement mortar.					
	a) 25 mm thick plaster ( external )					
	i) In ground floor	10.00	sq-mtr	₹ 187.00	₹ 1,870.00	
	b) 15 mm thick plaster (internal) 1:4 cement mortar					
	i) In ground floor	0.00	sq-mtr	₹ 156.00	₹ 0.00	
	c) 10 mm thick plaster					
	i) In ground floor	2.88	sq-mtr	₹ 126.00	₹ 362.88	
3	18 mm. to 22 mm. thick, kota stone slab set in 20 mm thick(avg) cement mortar (1:4) in floor, stair & lobby including pointing in cement slurry with admixture of pigment matching the stone shade,	8.55	Sq-mtr	₹ 1,010.00	₹ 8,635.50	Building Work SOR 2017 Vol-1 , Pg-54, It-17



	including grinding & polishing as per direction of Engineer - in - charge to match with the existing work. [Slurry for bedding @ 4.4 kg/Sq.m and pointing @2.0 kg/Sq.m]					
4	Supplying, fitting & fixing best quality digital printed Ceramictiles in coloured decorative on walls and floors to match with the existing work & 4 nos. key stones (10mm) fixed with adhesive 4.5 mm thick at the back of each tile & finishing the joints with white cement mixed with colouring oxide if required to match the colour of tiles including roughening of concrete surface, if necessary or by synthetic adhesive & grout materials etc. With polymerised adhesive and epoxy grout pointing including spacer - 2mm (When tiles are laid overexisting hard ready surface) all complete as per direction of Engineer-in-charge.	13.13	Sq-mtr	₹ 1,060.00	₹ 13,912.50	Building Work SOR 2017 Vol-I , Pg-68, It-39
5	Louvered window.i) Top, bottom and side member.	2.40	metre	₹ 196.00	₹ 470.40	Building Works SOR -2017, Pg-238 / It-h/i
6	PVC DOOR	1.00	each	₹ 1,900.00	₹ 1,900.00	MARKET RATE
7	Supplying and affixing optically clear polyester sun control window film having acrylic pressure sensitive adhesive on one side & an acrylicabrasion resistant coating on the other, with composition of infrared absorbing carbon & free from any optical defect. The film characteristics should conform to ASTM E308, ASTM E903, ASTM E84 and ASHRAE. The film should be pasted after preparatory works without any cracking, delamination, bubbling, scoloring and variation in total transmission of light across the width at any portion along the length doesn't exceed 2% over the average including scaffolding & relevant others to complete in all respect as per manufacturer's specification & direction of Engineer -in-Charge.(Note: This work should not be executed without specific permission of Superintending Engineer)(b) Superior Quality : Film	1.20	sq-mtr	₹ 544.00	₹ 652.80	Building Works SOR -2017, Pg-206 / It-8/b

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	Thickness - 2.0 Mil, Glare Reduction > 75%, U factor < 1.03, Emissivity < 0.70			
8	Sanitary plumbing			₹ 50,000.00
	Total cost			₹ 84,944.08

Executive Engineer  
WB-1/GAP/W&B Sector  
K.M.D.A.

### Electro-Mechanical Components Design of 7.5 MLD Pump House (Near Railway quarter, satragachi Jheel)

Serial No	Description	Present Flow:		Projected Flow for 15 years (2036):		Projected Flow for 30 years (2051):		8.5 MLD	
		Units	Quantity	Units	Quantity	Units	Quantity	Units	Quantity
<b>BASIC DATA FOR VERTICAL SHAFT CENTRIFUGAL PUMP</b>									
1	Discharge, Q	MLD	7.49	Factor		MLD	3.744469578	Discharge, Q	
		lps	86.678			lps	43.339		
		lpm	5200.652			lpm	2600.326		
		m3/sec	0.087			m3/sec	0.043		
		m3/min	5.201			m3/min	2.600		
		m3/hr	312.039			m3/hr	156.020		
								2.25	
								MLD	16.850
								lps	195.024
								lpm	11701.467
								m3/sec	0.195
								m3/min	11.701
								m3/hr	702.088



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		m3/day	7488.93915 5		m3/day	3744.469578		m3/day	16850. 1131
	Head								
	Static Head	m	5.35						
	Entry Exit Loss	m	0.10						
2	Rising Main Loss	m	3.03						
	Pumping Plant Loss	m	0.343						
	Total	m	8.823						
	Say	m	9						
3	Rising Main Diameter	mm	450						
4	Rising Main Length	m	1000						
<b>PUMP CONFIGURATION</b>									
	Pump Quantity of Type-I		DWF	Pump Quantity of Type-II		1/2-DWF		Pump Quantity of Type-II	2.25-DWF
5	Working	Nos	1	Working	Nos	1	Working	Nos	1
	Stand-By	Nos	1	Stand-By	Nos	1	Stand-By	Nos	0
6	Sewage flow to be pumped	m3/day	7488.93915 5	Sewage flow to be pumped	m3/day	3744.469578	Sewage flow to be pumped	m3/day	16850. 1131
7	Operating Hours	Hours	24	Operating Hours	Hours	24	Operating Hours	Hours	24
8	Required Capacity of Each Pump	m3/hr	312.04	Required Capacity of Each Pump	m3/hr	156.02	Required Capacity of Each Pump	m3/hr	702.09
9	Provided Capacity of Each Pump	m3/hr	313.00	Provided Capacity of Each Pump	m3/hr	157.00	Provided Capacity of Each Pump	m3/hr	703.00
		lps	86.94		lps	43.61		lps	195.28
<b>MOTOR CAPACITY</b>									
10	Discharge	lps	86.94	Discharge	lps	43.61	Discharge	lps	195.28



11	Head	m	9	Head	m	9	Head	m	9
12	Specific Gravity		1.03	Specific Gravity		1.03	Specific Gravity		1.03
13	BHP = Q in lpm X Head in m X Sp. Gravity/4500	HP	10.746	BHP = Q in lpm X Head in m X Sp. Gravity/4500	HP	5.390	BHP = Q in lpm X Head in m X Sp. Gravity/4500	HP	24.136
14	Pump Efficiency		80%	Pump Efficiency		80%	Pump Efficiency		80%
15	BHP input to Pump	HP	13.433	BHP input to Pump	HP	6.738	BHP input to Pump	HP	30.170
16	BKW to Pump	KW	10.025	BKW to Pump	KW	5.028	BKW to Pump	KW	22.515
17	Consider margin as per Manual		15%	Consider margin as per Manual		15%	Consider margin as per Manual		15%
		HP	15.803		HP	7.927		HP	35.495
		KW	11.794		KW	5.916		KW	26.489
18	Provided Capacity of Motor	HP	16.000	Provided Capacity of Motor	HP	8	Provided Capacity of Motor	HP	36
19	Operating Voltage	200+/-6% VOLT AC		Operating Voltage	200+/-6% VOLT AC		Operating Voltage	200+/-6% VOLT AC	

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POWER CALCULATION			1DWF + 1/2DWF	2DWF
20	Load of Pumps	HP	24	36
		KW	17.910	26.866
21	Incoming Load	KVA	19.900	29.851
22	Miscellaneous Load	KVA	0.398	0.597
23	Total Load	KVA	20.299	30.448

CALCULATION OF D.G. SET			1DWF +	2.25DWF
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		1/2DWF	
24	Considering 10% margin and 0.8 power factor for flow = Load*1.1/2*0.8	KVA	13.955
	Say	KVA	14
25	Check for Starting current, KW = 1.7321xV <sub>L</sub> xI <sub>L</sub> xPF	AMP	31.146
26	Current of Auxiliary Load	AMP	2.959
27	Total Current when one pump running	AMP	34.104
28	Starting Current of Pump on Soft Starter	AMP	186.873
	As we are using Star Delta Motor, starting current requirement is 4 times of motor rating		
29	Total Current	AMP	220.977
30	DG Sets are designed to withstand 50% overload for 30 Seconds	AMP	167.407
		KVA	120.437
	Say	KVA	125
Hence, Provide DG Set of 250 KVA			
<b>TRANSFORMER CAPACITY (1W+1S)</b>			
31	To ensure peak efficiency at about 75% of the rating, margin taken as 20%		
32	Total Peak Load with 20% margin and 0.8 PF	KV A	268.45
33	Total Current	AM P	167.407
		KV A	120.437
	Say	KV A	125
<b>Design of Column Pipe</b>			
	1/2 DWF	1 DWF	2.25 DWF



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34	Pump Capacity, m <sup>3</sup> /day	3744.470	7488.939	16850.113
35	Pipe material	CI / DI	CI / DI	CI / DI
36	Desired Velocity, m/s	1.5	1.5	1.5
37	Area needed, Sq.m	0.0289	0.0578	0.1300
38	Dia needed, m	0.1918	0.2712	0.4068
39	Dia needed, mm	192	272	407
40	Dia provided, mm	200	300	500

Provide 200mm, 300mm & 500mm respectively for 1/2 DWF, 1DWF & Peak DWF pipelines at zero year and change pumpsets at 16th year  
The augmentation at 16th year can be decided based on realistic condition at that time

### Electro-mechanical Cost of 7.5 MLD Pump House

Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
1	Pump (Type -I)	Supply, Installation, Testing & Commissioning of Submersible Pump haqving a head discharge characteristic of 156 m <sup>3</sup> /hr , along with new column pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor	2	Set	₹ 259,950.00	₹ 519,900.00	Market rate
2	Pump (Type -II)	Supply, Installation, Testing & Commissioning of Submersible Pump haqving a head discharge characteristic of 312 m <sup>3</sup> /hr , along with new column pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor	2	Set	₹ 342,750.00	₹ 685,500.00	Market rate
3	Pump (Type -III)	Supply, Installation, Testing & Commissioning of Pump haqving a head discharge characteristic of 702 m <sup>3</sup> /hr , along with new column	1	Set	₹ 589,750.00	₹ 589,750.00	Market rate

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Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
		pipes, shafts, sleeves, guide spiders, discharge head, motor stool, pressure gauge, air release valve etc. total complete as required as per site condition including motor					
4	Column Pipe (CI/DI)	Supply storage & installation of pump individual 200 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	2	Job	₹ 1,713.26	₹ 3,426.52	WS (UD & MA)-2018 Pg-(5-6), Item - 2.1.2 Rate analysis
		Supply storage & installation of pump individual 300 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	2	Job	₹ 2,906.19	₹ 5,812.38	
		Supply storage & installation of pump individual 500 mm delivery side pipes & specials as per specification (Length x Per meter Pipe Cost)	1	Job	₹ 5,619.19	₹ 5,619.19	
5	Valves (Type-I)	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 200 NB & DJ complete as per requirement for pump individual delivery.	2	Job	₹ 31,508.00	₹ 63,016.00	WS (UD & MA)-2018 pg-18 & 48 item-2.4.1 & 8.8 Rate analysis
6	Valves (Type-II)	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 300 NB & DJ complete as per requirement for pump individual delivery.	2	Job	₹ 57,131.00	₹ 114,262.00	
7	Valves (Type-II)	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 500 NB & DJ complete as per requirement for pump individual delivery.	2	Job	₹ 196,115.00	₹ 392,230.00	
8	EOT Crane	Supply, storage & installation of 3MT/5MT capacity EOT crane including MS inspection ladder all complete.	1	Job	₹ 681,850.00	₹ 681,850.00	Market rate
9	Level	Supply, Installation, Testing & Commissioning of ultrasonic level	1	Job	₹ 70,546.00	₹ 70,546.00	Market

Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
	Sensor	sensor including transmitter/transducer, signal cable, stilling pipe on the wet sump along with placing the display converter unit at suitable place near the control desk along with connection tonthe level meter on the control desk					rate
10	LT Pannel	Supply, storage & installation of LT MCC cum PDB as per specification in S/S building.	1	Nos	₹ 58,000.00	₹ 58,000.00	Rate analysis
11	DG	Supply, Commission of 250KVA DG	1	Job	₹ 720,000.00	₹ 720,000.00	Market rate
12	LT Cables	Supply, Installation, Testing of all HT/LT cables as required to complete the entire pumping station along with termination kits, and pipe protections, as required	1	Job	₹ 1,503,209.70	₹ 1,503,209.70	Rate analysis
13	Earthing	Supply, storage & installation of total earthing system for the entire installation as per specification.	1	Job	₹ 85,000.00	₹ 85,000.00	Rate analysis
14	RCC Chair Thrust Block	Supply, Installation of RCC chair thrust blocks of suitable size as required to complete the pump supports, valve supports, piping layout etc	1	Lot	₹ 25,000.00	₹ 25,000.00	Market rate
15	Lightning System	Supply, Storage & Installation of lightning Protection system as per Specification	1	Lot	₹ 50,000.00	₹ 50,000.00	Market rate
16	Steel Fabrication Work	Supply, installation of structural steel work for pedestal, panel mounting support walkway, cable tray etc. all completes as per specification and direction by EIC	1	Lot	₹ 810,333.33	₹ 810,333.33	Market rate
17	Fire Extinguisher	Supply, Installation, Testing & Commissioning of Fire extinguishers along with sand buckets as required	1	No	₹ 7,198.00	₹ 7,198.00	Market rate
18	Safety	Supply of Rubber mat, Hand Gloves, First Aid Box etc.	1	No	₹ 3,226.00	₹ 3,226.00	Market

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Serial No	ITEM	Description	Qty	Unit	Rate	Amount	Reference
	Instrument						rate
19	Illuminating system	Supply, Storage & Installation of internal & external illuminating system as per specification with timer	1	No	₹ 401,115.00	₹ 401,115.00	Market rate
20	Ventilation System	Supply, Storage & Installation of ventilation system as per specification	4	No	₹ 7,700.00	₹ 30,800.00	Market rate
21	Automatic Screener	Supply, Installation, Testing & Commissioning of electrically operated double stainless steel screen of 5 ton capacity with vertical lifting arrangement along with all accessories like guide channels, rests etc as required to complete the job. Hand Trolleys, scrapers, gloves as required are also to be included	1	Lot	₹ 1,750,000.00	₹ 1,750,000.00	Market rate
22	Penstock Gate	Supply, Installation, Testing & Commissioning of Penstock gates with extended spindle and hand wheel, guide frame complete as required (1200 x 1200 mm)	1	No	₹ 185,007.00	₹ 185,007.00	Market rate
23	Paintings	Painting all the electro-mechanical installations, railings, shutters, sundry materials, nuts, bolts, grease, jute etc	1	Lot	₹ 500,000.00	₹ 500,000.00	Market rate
24	Trial Run	Testing, trial run, commissioning cum operation maintenance of the entire system for 6 months to achieve the desired objective	1	Lot	₹ 100,000.00	₹ 100,000.00	Market rate
25	Technical Assistance	One Year technical assistance and guarantee towards maintenance of the newly installed equipment's	1	Lot	₹ 100,000.00	₹ 100,000.00	Market rate
26	Flow meter	Supply, fitting & fixing flow meter including all arrangements for pumping station	1	Lot	₹ 255,000.00	₹ 255,000.00	Market rate
		TOTAL.				₹ 9,715,801.12	



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### Bill of Quantity for Rising Main Pipeline

PUMP HOUSE (MLD)				1.45	7.5	Total	Average
Length			m	195	1000	1195	597.50
Proposed Size	Diameter Average	(W)	m	0.25	0.5	0.75	0.38
	Depth	(D)	m	0.25	0.5	0.75	0.38
Excavation	Depth		m	0.3	1.35	1.65	0.83
	Width		m	0.5	1	1.5	0.75
Earthwork Excavation	0-1.5m		Cum	29.25	1350	1379.25	689.63
	1.5-3.0m		Cum	0	0	0	0.00
	3.0-4.5m		Cum	0	0	0	0.00
Sand Filling		150mm	Cum	14.625	150	164.625	82.31
Single Layer BFS			Sq.m.	97.5	1000	1097.5	548.75
RCC		150mm	Cum	0	0	0	0.00
				0	0	0	0.00
PCC	Bedding	150mm	Cum	0	150	150	75.00
				0	0	0	
Pipe	150		mm	0	0	0	0.00
	200		mm	0	0	0	0.00
	250		mm	195	0	195	97.50
	300		mm	0	0	0	0.00
	350		mm	0	0	0	0.00
	400		mm	0	0	0	0.00
	500		mm	0	1000	1000	500.00
	600		mm	0	0	0	0.00
	700		mm	0	0	0	0.00
	800		mm	0	0	0	0.00
Shoring	0-1.5m		Sq.m.	117	2700	2817	1408.50
	1.5-3.0m		Sq.m.	0	0	0	0.00
	3.0-4.5m		Sq.m.	0	0	0	0.00
Earthwork Filling			Cum		778.56	778.56	778.56
Reinforcement			MT	0.418013		0.42	0.42



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Shuttering	Staging		Sq.m.		500	500	500.00
	Without Staging		Sq.m.		700	700	700.00
Removal of Rubish			Cum	29.25	571.5	600.75	300.38
Weepholes			Sq.m.	1	1	2	1.00
STRUT	Base		Cum	3.75	0	3.75	
	slab		Cum	1.575	0	1.575	
Road Restoration			Sq.m.		1000	1000.	1000



**New Rising Main Pipeline Laying 1195m**  
**Santragachi Jheel, I&D D.P.R. Project**

SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials upto a lead of 100 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD. <b>Bituminous courses and Granular courses</b> by manual means	cum	300.000	₹ 625.00	₹ 187,500.00	Road and Bridge Works SOR 2018; Vol. III, P-235 item-2.14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq. m.	1000.000	₹ 30.40	₹ 30,400.00	Road and Bridge Works SOR 2018; Vol. III, P-331; item no-18.02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL	% cum	1379.250	₹ 11,927.00	₹ 1,64,503.15	Building Works SOR 2017; Vol 1, p-1; Item-2a
4	(ii) Depth of excavation between 1.5m and 3.0m below GL	% cum	0.000	₹ 19,238.00	₹ 0.00	Building Works SOR 2017; Vol 1, p-1, Item-2b
5	(ii) Depth of excavation beLOW 3.0m GL	% cum	0.000	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol 1, p-1, Item-2c

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SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
6	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured) (This item should be executed on specific direction of the Engineer in charge). (i) Up to 1.5 m	sq. m.	2817.000	₹ 386.00	₹ 10,87,362.00	Building Works SOR 2017; Vol I, Item-6a
7	(ii) Depth between 1.5m and 3.0m below GL	sq. m.	1000.000	₹ 439.00	₹ 4,39,000.00	Building Works SOR 2017; Vol I, Item-6 b
8	(iii) For basement work and Depth beyond 3.00 m.	sq. m.	0.000	₹ 498.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6c
9	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(B) Do - by fine sand</b>	% cum	164.625	₹ 95,183.00	₹ 1,56,695.01	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
10	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	600.750	₹ 166.00	₹ 99,724.50	Building Work SOR 2017 Vol-I . Page no. 12 item-13
11	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	1097.500	₹ 357.00	₹ 3,91,807.50	Building Works SOR 2017; Vol I, page-14 Item-1 3rd Corrigenda & Addenda
12	Lowering any type of Ductile Iron (DI) pipes & specials and laying along trench at any depth as per specification and direction of the					



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SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	Engineer-in-charge, (laying over ground. the rates shall be, reduced by 10% and the rates so reduced shall be inclusive of cost of all sorts of holding including pipe cost as per section)					
	(i)250mm diameter (internal)	RM	195.000	₹ 2,906.19	₹ 5,66,707.05	Analysed rate
	(i)500mm diameter (internal)	RM	1000.000	₹ 5,619.19	₹ 56,19,190.00	Analysed rate
13	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement,if any, in ground floor as per relevant IS codes.	cum	155.325	₹ 5,506.62	₹ 8,55,316.47	Building Works SOR 2017; vol-I RATE ANALYSIS
14	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation, basement and upto roof of ground floor/upto 4 m Tor steel/Mild Steel SAIL/ TATA/RINL	MT	0.42	₹ 60,443.00	₹ 25,265.93	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA_page-1
15	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	% cum	778.563	₹ 7,754.00	₹ 60,369.74	Building Works SOR 2017; Vol I, p-1; Item-3a
16	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage					



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SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by compacting 1st class brick aggregates (40 mm down) and sand (in proportion of 60:40).	Cu.M.	164.625	₹ 2,130.80	₹ 3,50,782.95	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	82.313	₹ 2,748.09	₹ 2,26,201.75	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
	Providing and applying primer coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 and requisite quantity on					Analysed rate



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SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	prepared surface of granular base including cleaning of road surface and spraying primer using Mechanical means including cost and carriage of bitumen emulsion and all other incidental costs of work complete as per Clause 502 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For WBM / WMM Surface: (with primer @ 0.70-1.0 kg/sqm)	Sq.M.	1000.000	₹ 28.72	₹ 28,718.89	
	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
18	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	1097.500	₹ 9.31	₹ 10,212.85	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	1097.500	₹ 10.11	₹ 11,091.46	
	[Ref: Detail Estimate vide Annexure-F]					Analysed rate
19	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade,					Analysed rate



SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(1). For Grading (19 mm nominal size, 50-75 mm thick.)	Cu.M.	82.313	₹ 6,219.23	₹ 5,11,920.72	
	[Ref: Detail Estimate vide Annexure-G]					
20	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road &					Analysed rate

1037

SI NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH	Sq.M.	1097.500	₹ 129.21	₹ 1,41,808.92	
	[Ref: Detail Estimate vide Annexure-H]					
21	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					Analysed rate
	I By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	1097.500	₹ 40.38	₹ 44,319.94	
	[Ref: Detail Estimate vide Annexure-I]					
	Total				₹ 10,893,734.34	

  
 Executive Engineer  
 WB-I/GAP/W&B Sector,  
 K.M.D.A.



1039

# ANNEXURE -4

<b>A</b>	Cost of WSP	₹ 21,255,961.08
<b>B</b>	Cost of HDPE drainage pipe	₹ 869,481.45
	<b>Total</b>	₹ 22,125,442.52
	<b>with 12% GST</b>	₹ 24,780,495.63



*[Signature]*  
17/08/21  
Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

### Waste Stabilization Pond

SI No		Items	Unit	Quantity	Rate	Amount	SOR Reference
1.00	Dewatering	Pumping out water from ponds or tanks	%Cum	120500	₹ 1,044.00	₹ 1,258,020.00	Building SOR-2017 pg-4 item-8
2.00	sand filling	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A)</b> <b>Do - by fine sand</b>	%cum	42722.00	₹ 95,183.00	₹ 4,066,408.13	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
3.00	Earth work construction of Embankment from outside soil	Construction of Embankment - Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) a) With earth obtained by fresh excavation upto 1800 mm. depth (including the cost of excavation from land arranged by the Deptt. within a lead of 100 m.) (iii) With carried earth arranged by the contractor within a radius exceeding 5 km. but not exceeding 10 km. including cost of carried earth	Cum	4602.00	₹ 815.96	₹ 3,755,047.92	Rate analysis
4.00	gunny bags	Labour charges for dumping and placing in position properly filled in Nylon crates with filled in gunny / poly cement bags (minimum 25 nos. having capacity 50 kg) with local earth or sand, sewing and tying the crate with nylon wire within a lead of 150 m. and all lifts in river	Each	17588.904	₹ 418.00	₹ 7,352,161.87	Item-2.26, Page: c-12 of USOR(I&W)-2018



1040

Sl No	Items	Unit	Quantity	Rate	Amount	SOR Reference
	slope or bed by cutting trenches upto 50 cms depth, if necessary, or by boat including cost of hire charges of boat, boatmen and other necessary equipments and also including cost of bags, carriage and charge of filling bags with earth / sand but excluding cost of nylon crate as per direction of the Engineer – in – Charge. NB: Volume of each earth / sand filled bags should not be less than 0.028 m <sup>3</sup> . Size of Nylon crate is 1metre X 1metre X 1metre. (a) Where boats are not necessary.					
5.00	nylon cage	Each	14657.42	₹ 117.00	₹ 1,714,918.14	Item-2.25. Page: c-11 of LSOR(I&W)- 2018
6.00	1.5 mm HDPE Geo-membrane	Sq.m	7491.87	₹ 410.00	₹ 3,071,666.70	Market Rate
7.00	Anchoring at top	%Cum	191.75	₹ 11,927.00	₹ 22,870.02	Building SOR- 2017 pg-1 item-2 (a)

1041



Sl No	Items	Unit	Quantity	Rate	Amount	SOR Reference
	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work. a) With earth obtained from excavation of foundation.	%Cum	191.75	₹ 7,754.00	₹ 14,868.30	Building SOR-2017 pg-1 item-3 (a)
Total Amount					₹	21,255,961.08

### Bill of Quantity OF HDPE pipe - Santragachi Jheel

#17/28/21  
Executive Engineer  
WB-1/GAP/W&B Sector  
K.M.D.A.

Node No		Length	Proposed Size		Excavation		Earthwork Excavation			Single Layer BFS	PCC		
			Diameter (Width)	Inner Depth (Depth)	Depth	Width	0-1.5m	1.5-3.0m	3.0-4.5m		Bedding	Earthwork Filling	Removal of Rubish
From	To	m	(W)	(ID)	m	m	Cum	Cum	Cum	Sq.m.	100mm Cum	Cum	Cum
Start	End	345	0.25	0.25	0.525	0.590	106.86375	0	0	203.75	20.355	70.98	35.89
TOTAL		345	0.25	0.25	0.525	0.59	106.86375	0	0	203.75	20.355	70.9775	35.88625

### Cost of HDPE Pipe Line in Santragachi Jheel Area

1042



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL	%cu m	106.86	₹ 11,927.00	₹ 12,745.64	Building Works SOR 2017; Vol I, p-1; Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL	%cu m	0.00	₹ 19,238.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1. Item-2b
	(ii) Depth of excavation below 3.0m GL	%cu m	0.00	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2 c
2	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	35.89	₹ 166.00	₹ 5,957.12	Building Work SOR 2017 Vol-I, Page no. 12 item-13
3	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	203.75	₹ 357.00	₹ 72,738.75	Building Works SOR 2017; Vol I, page-14 Item-1 3rd Corrigenda & Addenda
4	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethylene Pipes conforming to IS 16098 (Part-II):2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 KN/Sqm. and Impact Resistance TIR value not more than 10% including necessary jointing materials for no pressure underground Drainage, Sewerage & Cross					

1043

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	drainage application.					
	250m diameter (internal)	RM	345.00	₹ 1,011.00	₹ 3,48,795.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23; ITEM - 36
5	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes.	cum	20.36	₹ 5,506.62	₹ 1,12,087.34	Building Works SOR 2017; vol-I RATE ANALYSIS
6	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	%cu m	70.98	₹ 7,754.00	₹ 5,503.60	Building Works SOR 2017; Vol I, p-1; Item-3a
7	Supply, storage & installation of various dia. CIDF actuator operated B/F valves NRV of 250 NB & DJ complete as per requirement for pump individual delivery.	Each	7.00	₹ 44,522.00	₹ 3,11,654.00	
	Total				₹ 8,69,481.45	



Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

1044

1045

# ANNEXURE -5

<b>A</b>	Cost of Land preparation New LS Inlet	₹ 1,495,895.60
<b>B</b>	Cost of Land preparation New LS Out let	₹ 1,693,947.40
<b>C</b>	Cost of Land preparation RCC pipe carrying Chamber	₹ 785,581.40
<b>D</b>	Cost of Cofferdam	₹ 18,018,359.53
	<b>Total</b>	₹ 21,993,783.93
	<b>with 12% GST</b>	<b>₹ 24,633,038.00</b>



  
Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

1046

## BOQ

Sl No.	Item	Dimension	Unit
Land preparation for 11m*22m			
1	Water Depth	3	m
2	Total Height of embankment of the water body upto RL.	4.5	m
3	Construction area; Width	11.0	m
4	Construction area; Length	22	m
5	Length of the filling area of Water body (Depth)	4.5	m
6	Total Length of Periphery of Construction area	66.00	m
7	Area of Construction land	242	Sq. M.
8	Size of Sal Bullah	150	mm
9	Height of Sal Bullah	7	m
10	Numbers of Sal Bullah required	440	nos.
11	Providing Sal Bullah	480	nos.



### Cost Estimate

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
A. Cost of Land Preparation							
1	Sal-Bullah	Supplying Sal-bullah piles at work site, including dressing and making one end pointed 150mm diameter	₹ 217.00	m	3360	₹ 7,29,120.00	Item-2.01, Page: c-8 of USOR(I&W)-2018
2	Labour for Sal-Bullah	Labour for driving Sal-bullah / Eucalyptus bullah piles by monkey in sorts of soil including oisting and placing piles in position, protecting the pile head with iron ring and cutting and shaping heads before and after driving and including hire and labour for necessary driving appliances and all tackles. 150mm diameter	₹ 105.00	m	70.0	₹ 7,350.00	Item-2.02, Page: c-8 of USOR(I&W)-2018
4	Gunny Bag	Supplying to site empty cement polythene bags (capacity 50kg) in good condition including stacking, incidental charges etc. all complete (capacity 50 kg). (Size: 0.75m x 0.5m)	₹ 6.00	per bag	4280	₹ 25,680.00	Item-2.24, Page: c-11 of USOR(I&W)-2018
5	Filling of Gunny Bag	Labour charges for filling empty cement gunny bag / polythene bag (capacity 50 kg) with all kinds of earth (wet or dry), sand or agreeegates(stone / brick) and sewing as done in case of cement bags ,(tying with a knot after filling will not be accepted ) , and stacking within alead of 30 metre as per direction of Engr-in-charge (cost is excluding the cost of any types of filling materials).	₹ 7.00	per bag	4280	₹ 29,960.00	Item-2.27, Page: c-12 of USOR(I&W)-2018
7	Drum Sheet	Walling or roofing fitted and fixed complete with cut drum sheets including the cost of drums, cost of cutting drums and flattening the sheets and cost of necessary nails and screws.	₹ 348.00	Sq.m	300	₹ 1,04,400.00	P-88, item -30-Pwd(B)-2018



7401

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		(Cost of empty bitumen drums issued by the Deptt. will be recovered at Rs. 100.00 for each drum)					
8	Sal-bullah tie	Labour for fitting and fixing 10 cm. to 13 cm. diameter Sal-bullah/Eucalyptus-bullah as ties and runners including necessary nails, bolts and nuts.	₹ 20.60	m	70	₹ 1,442.00	ref. It-18.41, P-338 of PWD(R)-2018
9	Earth Filling	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) With carried earth arranged by the contractor within a radius exceeding 5 km. but not exceeding 10 km. including cost of carried earth.	₹ 51,236.00	%Cum	1090	₹ 5,58,472.40	Page -3, item - 5b(iii)-PwD(B)-2017
11	Pump Out Water	Pumping out water from ponds or tanks	₹ 1,044.00	%Cum	730.00	₹ 7,621.20	P-4/ item 8-PwD(B)-2017
12	Silt clearance	Earthwork in re-excavation / silt clearance of drainage channels in all kinds of soil including sludge and slush but excluding slush mixed with industrial wastes, Sewage, municipal garbage, carcasses, etc and depositing the same as per profile in proper place as directed by the Engineer-in-charge without causing hindrance to traffic and posing health hazard and making arrangement to maintain the site in workable condition including removal of polypacks, brickbats, stone ballasts & boulders, remnants of bullah & bamboo pins and all kinds of water hyacinth, solid / semi solid compact mass formed due to water yacynth and burning them to ashes or removing outside Govt land where necessary and removal of thick & thorn	₹ 130.00	Cum	245.00	₹ 31,850.00	Item-1.11(a), Page: c-3 of USOR(I&W)-2018

8701



Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		jungles upto 30 cm girth including shoring and shuttering, if required, and including initial removal of sludge and slush etc by pan or bucket if required, and making arrangement for bailing out of any seepage water and removal of sand or soil blown from underneath. all complete. (Measurement : Pre-work and Post-work level section. Pre-work section to be taken after removal of water hyacinth and all other floating materials etc.)(a) By manual means within an initial lead of 30 M and an initial lift of 1.50 M					
Total Cost of Land Preparation						₹ 14,95,895.60	

  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.

1048



1050

## BOQ

Sl No.	Item	Dimension	Unit
Land preparation for 12m*26m			
1	Water Depth	3	m
2	Total Height of embankment of the water body upto RL.	4.5	m
3	Construction area; Width	12.0	m
4	Construction area; Length	26.0	m
5	Length of the filling area of Water body (Depth)	4.5	m
6	Total Length of Periphery of Construction area	76.00	m
7	Area of Construction land	312	Sq. M.
8	Size of Sal Bullah	150	mm
9	Height of Sal Bullah	7	m
10	Numbers of Sal Bullah required	507	nos.
11	Providing Sal Bullah	480	nos.



### Cost Estimate

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
A. Cost of Land Preparation							
1	Sal-Bullah	Supplying Sal-bullah piles at work site, including dressing and making one end pointed 150mm diameter	₹ 217.00	m	3360	₹ 7,29,120.00	Item-2.01, Page: c-8 of USOR(I&W)-2018
2	Labour for Sal-Bullah	Labour for driving Sal-bullah / Eucalyptus bullah piles by monkey in sorts of soil including oisting and placing piles in position, protecting the pile head with iron ring and cutting and shaping heads before and after driving and including hire and labour for necessary driving appliances and all tackles. 150mm diameter	₹ 105.00	m	80.0	₹ 8,400.00	Item-2.02, Page: c-8 of USOR(I&W)-2018
4	Gunny Bag	Supplying to site empty cement polythene bags (capacity 50kg) in good condition including stacking, incidental charges etc. all complete (capacity 50 kg). (Size: 0.75m x 0.5m)	₹ 6.00	per bag	4930	₹ 29,580.00	Item-2.24, Page: c-11 of USOR(I&W)-2018
5	Filling of Gunny Bag	Labour charges for filling empty cement gunny bag / polythene bag (capacity 50 kg) with all kinds of earth (wet or dry), sand or aggregates(stone / brick) and sewing as done in case of cement bags ,(tying with a knot after filling will not be accepted ) , and stacking within alead of 30 metre as per direction of Engr-in-charge (cost is excluding the cost of any types of filling materials).	₹ 7.00	per bag	4930	₹ 34,510.00	Item-2.27, Page: c-12 of USOR(I&W)-2018
7	Drum Sheet	Walling or roofing fitted and fixed complete with cut drum sheets including the cost of drums, cost of cutting drums and flattening the sheets and cost of necessary nails and screws.	₹ 348.00	Sq.m	345	₹ 1,20,060.00	P-88, item -30-Pwd(B)-2018

1051

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		(Cost of empty bitumen drums issued by the Deptt. will be recovered at Rs. 100.00 for each drum)					
8	Sal-bullah tie	Labour for fitting and fixing 10 cm. to 13 cm. diameter Sal-bullah/Eucalyptus-bullah as ties and runners including necessary nails, bolts and nuts.	₹ 20.60	m	80	₹ 1,648.00	ref. It-18.41, P-338 of PWD(R)-2018
9	Earth Filling	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) With carried earth arranged by the contractor within a radius exceeding 5 km. but not exceeding 10 km. including cost of carried earth.	₹ 51,236.00	%Cum	1405	₹ 7,19,865.80	Page -3, item - 5b(iii)-PwD(B)-2017
10	Pump Out Water	Pumping out water from ponds or tanks	₹ 1,044.00	%Cum	940.00	₹ 9,813.60	P-4/ item 8-PwD(B)-2017
11	Silt clearance	Earthwork in re-excavation / silt clearance of drainage channels in all kinds of soil including sludge and slush but excluding slush mixed with industrial wastes, Sewage, municipal garbage, carcasses, etc and depositing the same as per profile in proper place as directed by the Engineer-in-charge without causing hindrance to traffic and posing health hazard and making arrangement to maintain the site in workable condition including removal of polypacks, brickbats, stone ballasts & boulders, remnants of bullah & bamboo pins and all kinds of water hyacinth, solid / semi solid compact mass formed due to water yacynth and burning them to ashes or removing outside Govt land where necessary and removal of thick & thorn	₹ 130.00	Cum	315.00	₹ 40,950.00	Item-1.11(a), Page: c-3 of USOR(I&W)-2018



1052

1050

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		jungles upto 30 cm girth including shoring and shuttering, if required, and including initial removal of sludge and slush etc by pan or bucket if required, and making arrangement for bailing out of any seepage water and removal of sand or soil blown from underneath, all complete. (Measurement : Pre-work and Post-work level section. Pre-work section to be taken after removal of water hyacinth and all other floating materials etc.) (a) By manual means within an initial lead of 30 M and an initial lift of 1.50 M					
Total Cost of Land Preparation						₹ 16,93,947.40	

  
 7/08/21  
 Executive Engineer  
 WB-I/GAP/W&B Sector,  
 K.M.D.A.



1053

1054

## BOQ

SI No.	Item	Dimension	Unit
Land preparation for 3m*3m			
1	Water Depth	3	m
2	Total Height of embankment of the water body upto RL	4.5	m
3	Construction area; Width	3.0	m
4	Construction area; Length	3	m
5	Length of the filling area of Water body (Depth)	4.5	m
6	Total Length of Periphery of Construction area	12.00	m
7	Area of Construction land	9	Sq. M.
8	Size of Sal Bullah	150	mm
9	Height of Sal Bullah	7	m
10	Numbers of Sal Bullah required	80	nos.
11	Providing Sal Bullah	480	nos.



### Cost Estimate

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
A. Cost of Land Preparation							
1	Sal-Bullah	Supplying Sal-bullah piles at work site, including dressing and making one end pointed 150mm diameter	₹ 217.00	m	3360	₹ 7,29,120.00	Item-2.01, Page: c-8 of USOR(I&W)-2018
2	Labour for Sal-Bullah	Labour for driving Sal-bullah / Eucalyptus bullah piles by monkey in sorts of soil including oisting and placing piles in position, protecting the pile head with iron ring and cutting and shaping heads before and after driving and including hire and labour for necessary driving appliances and all tackles. 150mm diameter	₹ 105.00	m	20.0	₹ 2,100.00	Item-2.02, Page: c-8 of USOR(I&W)-2018
4	Gunny Bag	Supplying to site empty cement polythene bags (capacity 50kg) in good condition including stacking, incidental charges etc. all complete (capacity 50 kg). (Size: 0.75m x 0.5m)	₹ 6.00	per bag	780	₹ 4,680.00	Item-2.24, Page: c-11 of USOR(I&W)-2018
5	Filling of Gunny Bag	Labour charges for filling empty cement gunny bag / polythene bag (capacity 50 kg) with all kinds of earth (wet or dry), sand or aggregates(stone / brick) and sewing as done in case of cement bags ,(tying with a knot after filling will not be accepted ) , and stacking within alead of 30 metre as per direction of Engr-in-charge (cost is excluding the cost of any types of filling materials).	₹ 7.00	per bag	780	₹ 5,460.00	Item-2.27, Page: c-12 of USOR(I&W)-2018
7	Drum Sheet	Walling or roofing fitted and fixed complete with cut drum sheets including the cost of drums, cost of cutting drums and flattening the sheets and cost of necessary nails and screws.	₹ 348.00	Sq.m	55	₹ 19,140.00	P-88, item -30-Pwd(B)-2018



1055

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		(Cost of empty bitumen drums issued by the Deptt. will be recovered at Rs. 100.00 for each drum)					
8	Sal-bullah tie	Labour for fitting and fixing 10 cm. to 13 cm. diameter Sal-bullah/Eucalyptus-bullah as ties and runners including necessary nails, bolts and nuts.	₹ 20.60	m	20	₹ 412.00	ref It-18-41, P-338 of PWD( R)-2018
9	Earth Filling	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) With carried earth arranged by the contractor within a radius exceeding 5 km. but not exceeding 10 km. including cost of carried earth.	₹ 51,236.00	%Cum	45	₹ 23,056.20	Page -3, item - 5b(iii)-PwD(B)-2017
11	Pump Out Water	Pumping out water from ponds or tanks	₹ 1,044.00	%Cum	30.00	₹ 313.20	P-4/ item 8-PwD(B)-2017
12	Silt clearance	Earthwork in re-excavation / silt clearance of drainage channels in all kinds of soil including sludge and slush but excluding slush mixed with industrial wastes, Sewage, municipal garbage, carcasses, etc and depositing the same as per profile in proper place as directed by the Engineer-in-charge without causing hindrance to traffic and posing health hazard and making arrangement to maintain the site in workable condition including removal of polypacks, brickbats, stone ballasts & boulders, remnants of bullah & bamboo pins and all kinds of water hyacinth, solid / semi solid compact mass formed due to water yacynth and burning them to ashes or removing outside Govt land where necessary and removal of thick & thorn	₹ 130.00	Cum	10.00	₹ 1,300.00	Item-1.11(a), Page- c-3 of USOR(I&W)-2018



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Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		jungles upto 30 cm girth including shoring and shuttering, if required, and including initial removal of sludge and slush etc by pan or bucket if required, and making arrangement for bailing out of any seepage water and removal of sand or soil blown from underneath, all complete. (Measurement : Pre-work and Post-work level section. Pre-work section to be taken after removal of water hyacinth and all other floating materials etc.)(a) By manual means within an initial lead of 30 M and an initial lift of 1.50 M					
Total Cost of Land Preparation						₹ 7.85,581.40	

  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.

1057



### BOQ of Cofferdam

Sl. No.	Item	Dimension	Unit
Cofferdam for (394m x 2m) Area:			
1	Top width of Construction Area:	554	m
2	Bottom width of Construction Area :	554	m
3	Water Depth:	4.5	m
4	Side Slope (1 in )	1	
5	Difference between Top width and Bottom width of Construction Area:	0	m
6	Total Height of embankment of the construction:	3	m
7	Construction area; Width	2.0	m
8	Construction area; Length	554.0	m
9	Length of the filling area of Cofferdam (Thickness)	2.0	m
10	Total Length of Inner Periphery of Cofferdam	1112.00	m
11	Outer Width of the Cofferdam	5.00	m
12	Outer Length of Cofferdam at the Canal bed	555.50	m
13	Total Length of Outer Periphery of Cofferdam (except Slant side)	1116.00	m
14	Inner Area of Cofferdam of Construction Area	1108	Sq. M.
15	Outer Area of Cofferdam of Construction Area	2777.5	Sq. M.
16	Size of Sal Bullah	150	mm
17	Height of Sal Bullah	7	m
18	Height of Sal Bullah at the edge of the side of Construction Area	4	m
19	Numbers of Sal Bullah required at the bottom of Construction Area to block half of the Construction Area l bed (Inner side)	7414	nos.
20	Numbers of Sal Bullah required at the bottom of Construction Area to block half of the Construction Area bed (Outer side)	7440	nos.
21	Total Sal Bullah required	14854	nos.
22	Providing Sal Bullah for Cofferdam	5334	nos.



### Cost Estimate of Coffor Dam

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
A. Cost of Bigger Coffor Dam							
1	Sal-Bullah	Supplying Sal-bullah piles at work site, including dressing and making one end pointed 150mm diameter	₹ 217.00	m	37338	₹ 81,02,346.00	Item-2.01, Page: c-8 of USOR(I&W)-2018
2	Labour for Sal-Bullah	Labour for driving Sal-bullah / Eucalyptus bullah piles by monkey in sorts of soil including oisting and placing piles in position, protecting the pile head with iron ring and cutting and shaping heads before and after driving and including hire and labour for necessary driving appliances and all tackles. 150mm diameter	₹ 105.00	m	2230.0	₹ 2,34,150.00	Item-2.02, Page: c-8 of USOR(I&W)-2018
3	Dismantling of Sal-Bullah	Taking out Sal-bullah / Eucalyptus piles from river bed or from elsewhere including carrying stacking materials in the nearest stack yard. Up to 17.5 cm. diameter.	₹ 11.80	m	37338	₹ 4,40,588.40	Item-2.03, Page: c-9 of SOR(I&W)-2017
4	Gunny Bag	Supplying to site empty cement polythene bags (capacity 50kg) in good condition including stacking, incidental charges etc. all complete (capacity 50 kg). (Size: 0.75m x 0.5m)	₹ 6.00	per bag	160520	₹ 9,63,120.00	Item-2.24, Page: c-11 of USOR(I&W)-2018
5	Filling of Gunny Bag	Labour charges for filling empty cement gunny bag / polythene bag (capacity 50 kg) with all kinds of earth (wet or dry), sand or agreeegates(stone / brick) and sewing as done in case of cement bags ,(tying with a knot after filling will not be accepted ) , and stacking within alead of 30 metre as per direction of Engr-in-charge (cost is excluding the cost of any	₹ 7.00	per bag	160520	₹ 11,23,640.00	Item-2.27, Page: c-12 of USOR(I&W)-2018

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Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
		types of filling materials).					
6	Silver Sand	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) (5% extra to counter the loss)	₹ 93,621.00	%Cum	1402.5	₹ 13,13,034.53	Page -2, item 4B -PwD(B)-2017
7	Drum Sheet	Walling or roofing fitted and fixed complete with cut drum sheets including the cost of drums, cost of cutting drums and flattening the sheets and cost of necessary nails and screws. (Cost of empty bitumen drums issued by the Deptt. will be recovered at Rs. 100.00 for each drum)	₹ 348.00	Sq.m	11140	₹ 38,76,720.00	P-88, item - 30-PwD(B)-2018
8	Sal-bullah tie	Labour for fitting and fixing 10 cm. to 13 cm. diameter Sal-bullah/Eucalyptus-bullah as ties and runners including necessary nails, bolts and nuts.	₹ 20.60	m	2230	₹ 45,938.00	ref. It-18-41. P-338 of PWD( R)-2018
9	Earth Filling	Earth work in filling in compound, tank, low land, ditches etc. with good earth, in layers not exceeding 150 mm. including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work) With carried earth arranged by the contractor within a radius exceeding 5 km. but not exceeding 10 km. including cost of carried earth.	₹ 51,236.00	%Cum	2785	₹ 14,26,922.60	Page -3, item - 5b(iii)-PwD(B)-2017
10	Pump Out Water	Pumping out water from ponds or tanks	₹ 1,044.00	%Cum	12500.00	₹ 1,30,500.00	P-4/ item 8-PwD(B)-2017
11	Silt	Earthwork in re-excavation / silt clearance of drainage channels	₹ 130.00	Cum	2780.00	₹ 3,61,400.00	Item-1.11(a).

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1901

Sl no.	Item	Description of Item	Rate	Unit	Quantity	Amount	Source
	clearance	in all kinds of soil including sludge and slush but excluding slush mixed with industrial wastes, Sewage, municipal garbage, carcasses, etc and depositing the same as per profile in proper place as directed by the Engineer-in-charge without causing hindrance to traffic and posing health hazard and making arrangement to maintain the site in workable condition including removal of polypacks, brickbats, stone ballasts & boulders, remnants of bullah & bamboo pins and all kinds of water hyacinth, solid / semi solid compact mass formed due to water yacinth and burning them to ashes or removing outside Govt land where necessary and removal of thick & thorn jungles upto 30 cm girth including shoring and shuttering, if required, and including initial removal of sludge and slush etc by pan or bucket if required, and making arrangement for bailing out of any seepage water and removal of sand or soil blown from nderneath, all complete. (Measurement : Pre-work and Post-work level section. Pre-work section to be taken after removal of water hyacinth and all other floating materials etc.) (a) By manual means within an initial lead of 30 M and an initial lift of 1.50 M					Page: c-3 of USOR(I&W)-2018
Cost of One coffer dam to block one side of water						₹ 18,018,359.53	



#  
12/08/21  
Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

# ANNEXURE -6

<b>A</b>	Cost of RCC pipe carrying chamber	₹ 128,788.64
<b>B</b>	Cost of Cross-drainage pipe	₹ 470,651.92
<b>C</b>	Cost of public toilet	₹ 782,557.00
<b>D</b>	Cost of Septic Tank	₹ 92,204.71
	<b>Total</b>	₹ 1,474,202.27
	<b>with 12% GST</b>	<b>₹ 1,651,106.55</b>

  
Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.





BOQ of Proposed RCC pipe carrying chamber (2nos + 400 mm Pipe)																													
	Proposed Size of Chamber			Proposed Size of Piping			Excavation size			Earthwork Excavation			Sand Filling		BFS	PCC	RCC				Shoring			Shuttering					
	Length	Width	Depth	Length	Width	Diameter	Length	Width	Depth	0-1.5m	1.5-3.0m	3.0-4.5m	1.5m filling				Casins wall for pipe	Wall	Top Slab	Bottom Slab	0-1.5m	1.5-3.0m	3.0-4.5m	Staging	Without Staging	Staging			
	including 200 mm pipe casin						upto 200 mm						Total width (1.3 + 0.1) = 1.4 m		100 mm	200 mm	150 mm	150 mm	150 mm										
	m	m	m	m	m	m	m	m	m	m	m	m	Cum	Sq m	Cu m	Cu m	Cu m	Cu m	Cu m	Sq m	Sq m	Sq m							
For 1 chamber	1.3	1.3	3.4				1.3	0.6	3.4	1.17	1.17	0.312	2.73	1.69	0.169														
For 2 chambers total	2.6	2.6	6.8				2.6	1.2	6.8	2.34	2.34	0.624	5.46	3.38	0.338			4.8016	0.507	0.507	7.5	7.5	2	3.536	0.1163	79.32	39.66	19.83	2

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Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	b) Depth of Excavation exceeding 1,500 mm upto 3,000 mm	%cum	2.34	₹ 19,238.00	₹ 450.17	
	c) Depth of Excavation exceeding 3,000 mm	%cum	0.62	₹ 23,470.00	₹ 146.45	
3	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation; (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Enginner in charge). (i) Up to 1.5 m	Sq.m	7.50	₹ 386.00	₹ 2,895.00	Building Works SOR 2017, Vol I, p-3 item-6(a,b)
	(ii) 1.5 m to 3.0m	Sq.m	7.50	₹ 439.00	₹ 3,292.50	
	(iii) beyond 3.0m	Sq.m	2	₹ 498.00	₹ 996.00	
4	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm, including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) (a) With earth obtained from excavation of foundation.	%Cum	3.54	₹ 7,754.00	₹ 274.18	Building Works SOR 2017, Vol I, p-1, Item-3 a
5	Removal of rubbish,earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	2.00	₹ 166.00	₹ 332.00	Building Work SOR 2017 Vol-I , Page no. 12 item-13

1065



Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
6	Hire and labour charges for shuttering with centering and necessary staging upto 4 m using approved stout props and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams and columns, lintels curved or straight including fitting, fixing and striking out after completion of works (upto roof of ground floor) 25mm to 30mm thick wooden shuttering as per decision and Direction of engg in charge	sqm	80.92	₹ 335.00	₹ 27,108.60	PWD SOR 2017 Vol-1 , Page no. 42-43 , item-36 (a,f)
	f) 25 mm to 30 mm shuttering without staging in foundation	sqm	39.66	₹ 209.00	₹ 8,288.94	
7	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers (A) Do - by fine sand	%cum	14.91	₹ 95,183.00	₹ 14,191.79	Building Works SOR 2017; Vol I. page-2 Item-4b 5th Corrigenda & Addenda
8	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand with Labour charges	sq. m.	6.98	₹ 357.00	₹ 2,491.86	Building Works SOR 2017; Vol I. page-14 Item-1 3rd Corrigenda & Addenda
9	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement,if any, in ground floor as per relevant IS codes.	cum	0.70	₹ 5,265.18	₹ 3,675.09	Building Works SOR 2017; vol-I RATE ANALYSIS



1066

Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
10	Supplying & laying Double Wall Corrugated (with external annular corrugation and smooth internal walls) High Density Polyethelene Pipes conforming to IS 16098 (Part-II):2013 having Stiffness Class of SN 8 with Ring Stiffness not less than 8.00 KN/Sqm. and Impact Resistance TIR value not more than 10% including necessary jointing materials for nonpressure underground Drainage, Sewerage & Cross drainage application.					
	400m diameter (internal)	RM	4.50	₹ 1,950.00	₹ 8,775.00	SANITARY AND PLUMBING SOR 2017 Vol-II, p-23; ITEM - 35
11	RCC: Supplying ready mixed concrete of M 25 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid	cum	6.48	₹ 7,361.01	₹ 47,708.15	Building Works SOR Vol-I, Rate Analysis

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Sl. No	Description of Item	Units	Qty	Rate in INR	Amount in INR	SOR References
	through separate item					
12	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, binders etc initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16-gauge black annealed wire at every intersection, complete as per drawing and direction. For works in foundation, basement and upto roof of ground floor/upto 4 m Tor steel/Mild Steel SAIL/TATA/RINL	MT	0.13	₹ 60,580.00	₹ 7,852.62	Building Works-SOR 2017, P-44, Item 40 (a)(i), 10th CORRIGENDA
Total					₹ 128,788.64	



  
 Executive Engineer  
 WB-I/GAP/W&B Sector,  
 K.M.D.A.

### Bill of Quantity OF Cross Drainage pipe - Santragachi Jheel

Node No		Length	Proposed Size			ID /4 min 100 mm	OD	Excavation			Earthwork Excavation			Sand Filling	Single Layer B.F.S	PCC		Shoring			Earth work Filling	Shuttering		Removal of Rubish
			Diameter (Width)	Inner Depth (Depth)	Outer Diameter			Depth	Width	0-1.5 m	1.5 - 3.0 m	3.0 - 4.5 m	Cum			Cum	Cum	Cum	Sq.m.	Cum		0-1.5 m	1.5 - 3.0 m	
From	To	m	(W)	(ID)	(OD)	m	m	m	m	Cum	Cum	Cum	Cum	Sq.m.	Cum	Sq.m.	Sq.m.	Sq.m.	Cum	Sq.m.	Sq.m.	Cum		
Start	End	50	0.6	0.6	0.77	0.15	0.385	1.500	1.200	90	0	0	4.5	60	17.282	150	0	0	63.72	60	30	26.28		
TOTAL		50	0.6	0.6	0.77	0.15	0.385	1.5	1.2	90	0	0	4.5	60	17.282	150	0	0	63.717831	60	30	26.282169		

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### Cost of 600 mm Cross Drainage Pipe Line in Santragachi Jheel Area

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
1	Dismantling of flexible pavements and disposal of dismantled materials upto a lead of 100 m, stacking serviceable and unserviceable materials separately as per Technical Specifications Clause 202 for Rural Roads of MORD. <b>Bituminous courses and Granular courses</b> by manual means	cum	18.00	₹ 625.00	₹ 11,250.00	Road and Bridge Works SOR 2018; Vol. III, P-235 item-2.14(i)
2	Picking up and removing old bituminous layer or sand sealing coat from old black topped surface and cleaning the exposed surface by scraping and stacking the material as directed. 50mm to 100mm thick	sq. m.	60.00	₹ 30.40	₹ 1,824.00	Road and Bridge Works SOR 2018; Vol. III, P-331, item no-18.02(ii)
3	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete. (i) Depth of excavation not exceeding 1.5m below GL.	%cum	90.00	₹ 11,927.00	₹ 10,734.30	Building Works SOR 2017; Vol I, p-1; Item-2a
	(ii) Depth of excavation between 1.5m and 3.0m below GL	%cum	0.00	₹ 19,238.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2b
	(ii) Depth of excavation beLOW 3.0m GL	%cum	0.00	₹ 23,470.00	₹ 0.00	Building Works SOR 2017; Vol I, p-1, Item-2



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ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
						c
4	Hire and labour charges for shoring work (including necessary close plank walling, framing, Eucalyptus/Jhou bulla piling, strutting etc) complete as per direction of the Engineer-in-charge for foundation excavation (vertical surface are in contact with supported earth is to be measured.) (This item should be executed on specific direction of the Engineer in charge). (i) Up to 1.5 m	sq. m.	150.00	₹ 386.00	₹ 57,900.00	Building Works SOR 2017; Vol I, Item-6a
	(ii) Depth between 1.5m and 3.0m below GL	sq. m.	0.00	₹ 439.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6 b
	(iii) For basement work and Depth beyond 3.00 m.	sq. m.	0.00	₹ 498.00	₹ 0.00	Building Works SOR 2017; Vol I, Item-6c
5	Filling in foundation by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity) 2-100mm layers <b>(A) Do - by fine sand</b>	%cum	4.50	₹ 95,183.00	₹ 4,283.24	Building Works SOR 2017; Vol I, page-2 Item-4b 5th Corrigenda & Addenda
6	Removal of rubbish, earth etc. from the working site and disposal of the same beyond the compound, in conformity with the Municipal / Corporation Rules for such disposal, loading into truck and cleaning the site in all respect as per direction of Engineer in charge	cum	26.28	₹ 166.00	₹ 4,362.84	Building Work SOR 2017 Vol-I , Page no. 12 item-13
7	Single Brick Flat Soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints	sq. m.	60.00	₹ 357.00	₹ 21,420.00	Building Works SOR 2017, Vol I, page-14

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	with local sand with Labour charges					Item-1 3rd Corrigenda & Addenda
8	Providing and laying reinforced cement concrete pipe NP4 with spigot socket for culverts on first class bedding of granular material in single row including fixing with cement mortar 1:2 as per Technical Specification					
	600m diameter (internal)	RM	50.00	₹ 3,024.00	₹ 151,200.00	Road SOR 2018, p-282; ITEM - 11.04
9	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement,if any, in ground floor as per relevant IS codes.	cum	17.28	₹ 5,506.62	₹ 95,166.42	Building Works SOR 2017; vol-I RATE ANALYSIS
12	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) with earth obtained from excavation of foundation.	%cum	63.72	₹ 7,754.00	₹ 4,940.68	Building Works SOR 2017; Vol I, p-1; Item-3a
13	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H					

1072



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	(5th Revision).					
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40).	Cu.M.	9.000	₹ 2,130.80	₹ 19,177.20	Analysed rate
	[Ref: Detail Estimate vide Annexure-C]					
14	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary. hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening.	Cu.M.	4.500	₹ 2,748.09	₹ 12,366.38	Analysed rate
	[Ref: Detail Estimate vide Annexure-D]					
15	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including					



1073

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(i) On Bituminous Surface (Using Bitumen Emulsion at the rate of 0.20 to 0.30 kg per sqm.)	Sq.M.	60.000	₹ 9.31	₹ 558.33	Analysed rate
	(ii) On Granular surfaces treated with primer (Using Bitumen emulsion at the rate of 0.25 to 0.30 kg per sqm.)	Sq.M.	60.000	₹ 10.11	₹ 606.37	Analysed rate
	[Ref: Detail Estimate vide Annexure-F]					
16	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	(1). For Grading 2 (19 mm nominal size, 50-75 mm thick.)	Cu.M.	4.500	₹ 6,219.23	₹ 27,986.55	Analysed rate



1074

1075

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	[Ref: Detail Estimate vide Annexure-G]					
17	Providing, laying and rolling of Open - graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut-back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base. including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	Using Batch Type HMP of minimum capacity 100-120 TPH.	Sq.M.	60.000	₹ 129.21	₹ 7,752.65	Analysed rate
	[Ref: Detail Estimate vide Annexure-H]					
18	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with					



ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).					
	I By Mechanical Means					
	(i) With Hot Bitumen Binder (@ 6.80 kg / 10 sqm.)	Sq.M.	60.000	₹ 40.38	₹ 2,422.96	Analysed rate
	[Ref: Detail Estimate vide Annexure-I]					
19	Construction of manhole with chamber of size as given below as per requirement without shaft with cement brick work (1:4) over 150mm. thick jhama cement conc. (1:4:8) bed over a layer of brick flat soling including providing 150mm. thick R.C.C. slab with ordinary cement concrete (mix 1:1.5:3) with reinforcement as per standard drawing over the chamber, brick on edge flooring with ordinary cement concrete (mix 1:2:4) in the invert with 20mm. thick cement plastering (1:4) finished fine with neat cement 1.50 mm. thick in the inside walls and invert, including supplying, fitting and fixing R.C.P.C. manhole cover & frame (35 M.T. load					SD Schedule 2018-19 (UD & MA) pg-20 Item-24 (d)



1076

ITEM NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT	SOR REFERENCE
	bearing capacity) with ordinary cement concrete (mix 1:2:4) & C.I. steps (4kg. Each) including cutting hard crust, excavation, dewatering, back filling and removal of spoils but excluding shoring complete as per standard drawing.					
	d) Above 900 mm to 1200 mm Dia having internal size (1500mm × 1600mm)	EACH	1.000	₹ 36,700.00	₹ 36,700.00	
	Total				₹ 4,70,651.92	

  
 17/08/21  
 Executive Engineer  
 WB-1/GAP/W&B Sector,  
 K.M.D.A.

1077



1078

## Bill of Quantity for Public Toilet

	Items	No	Length	Width	Height	Quantity	unit
1	Surface Dressing						
	Site(Lengthxbreadth)	1	4.5	4		18.000	sq. m
2	Earthwork in excavatoin						
	upto 1500mm depth	4	1.5	1.5	1.2	10.800	
					Say	12.000	cu m
	P.c.c	4	1.35	1.35	0.75	5.468	
		1	4	3.5	1	14.000	
						19.468	
					Say	20.000	cu m
3	Reinforcement cement concret						
	foundation	4	1.2	12	0.15	8.640	
	column	4	0.25	0.35	4.8	1.680	
	tie beam	4	0.25	0.35	4.25	1.488	
	lindle beam	5	0.75	0.15	0.25	0.141	
		3	1	0.15	0.25	0.113	
	chajja	5	0.75	0.3	0.075	0.084	
	chajja	3	1	0.3	0.075	0.068	
	roof beam	4	0.25	0.35	4.25	1.488	



1079

	Items		No	Length	Width	Height	Quantity	unit
		slab	1	4.5	4	0.01	0.180	
							13.880	
						Say	14.000	cu m
5	Reinforcement work	2% of conc. Vol.					2.198	
						Say	2.500	mt
5	Earthwork in filling	upto 1500 depth	4	1.2	1.2	1	5.760	
						Say	6.000	cu m
6	Sand filling							
		in plinth	1	4	4.5	0.45	8.100	
							8.100	
						Say	10.000	cu m
					SI DE			
10	Shuttering work reservoir (basement)	foundation	4	4	1.2	0.2	3.840	
		#NAME?						
		column	4	0.25	2	4.8	9.600	
			4	0.35	2	4.8	13.440	
		Lintle	5	0.9	2	0.15	1.350	
		chajja	6	0.9	0.3		1.620	
			3	1	2	0.15	0.900	
		Tie beam	2	4	0.35		2.800	
			1	4	0.25		1.000	
			2	4.5	0.3		3.150	



	Items	No	Length	Width	Height	Quantity	unit
				5			
		1	4.5	0.25		1.125	
	roof beam	2	4	0.35		2.800	
		1	4	0.25		1.000	
		2	4.5	0.35		3.150	
		1	4.5	0.25		1.125	
	roof	1	4.5	4		36.000	
	side of roof	1	17	0.15	1	5.100	
						88.000	
					Say	90.000	
1	Brick work (1:4) 250 Thk.	2	4.5	0.25	0.6	1.350	
1		2	4	0.25	0.6	1.200	
	super str.	2	4.5	0.25	2.7	6.075	
		2	4	0.25	2.7	5.400	
	Deduct for Window shutter opening	5	0.6	0.6	2.7	-1.800	
	Deduct for door shutter opening	1	1	0.25	2.1	-0.250	
						11.975	cu m
					Say	12.000	
1	Brick work (1:4) 125 thk						
2		2	2.15	2.25		4.838	sq m



1081

	Items		No	Length	Width	Height	Quantity	unit
			1	0.5	2.25		1.125	
							5.963	
						Say	6.000	
13	15mm plaster (1:4) inside		4	2.15	2.25		19.350	
			1	0.5	2.25		1.125	
			2	4	2.9		23.200	
			2	3.5	2.9		20.300	
		Deduct for Window opening	5	0.6	0.6	0	-1.800	
		Deduct for door opening	1	1	2.1		62.175	
						Say	62.500	sq. m
	25mm plaster (1:4) out side		2	4.5	2.9		26.100	
			2	4	2.9		23.200	
	10mm plaster (1:4)	ceiling	1	4	3.5		14.000	sq. m
14	Flooring work	floor	1	4	3.5	0	14	
		Skirting of floor	1	24	0.15	0	3.6	sq. m.
							17.600	



1082

	Items	No	Length	Width	Height	Quantity	unit
15	ceramic tile for toilet	2	4	2.1		16.8	
		2	3.5	2.1		14.7	
		4	2.1 5	2.1		18.06	
		4	0.5	2.1		4.2	
						53.76	sq m.
	Window less	5	0.6	0.6		-1.8	
						-1.800	
						51.96 0	sq m.
15	Neat cement punning	2	4.5	0.6		5.4	
		2	4	0.6		4.8	
						10.2	
19	Wood work for frame	Main door frame	3	4.9 5	0.1	0.0 75	0.183 76875
				10. 65	0.1	Say 0.200	cu m
20	Wood work for shutter	Main door shutter	3	0.7 5	2.0 25		4.556 25
			2	0.6 5			4.556 25
						Say 6.000	sq m.
21	M.s Clamp for fixing door	door	3	6		18	Each
22	Iron butt hinges	door	3	6		18	Each



	Items	No	Length	Width	Height	Quantity	unit
23	Iron socket bolt	3	2			6	Each
24	Iron hasp bolt	3	1			3	Each
13	wall patty inside	4	2.15	2.25		19.350	
		1	0.5	2.25		1.125	
		2	4	2.9		23.200	
		2	3.5	2.9		20.300	
	Deduct for Window opening	5	0.6	0.6	0	-1.800	
	Deduct for door opening	1	1	2.1		62.175	
					Say	62.500	sq. m
26	louverd window for aluminium	5	2.4	0.6		7.200	
28	windor glaze	6	0.5	0.1	5	1.5	sq m
30	Wooden surface priming	3	0.75	2.025	2	9.1125	S Q M
31	priming inside	4	2.15	2.25		19.350	
		1	0.5	2.25		1.125	
		2	4	2.9		23.200	
		2	3.5	2.9		20.300	
		5	0.6	0.6	0	-1.800	
						62.17	



Items	No	Len m	W m	H m	Quant ity	Unit
	1	1	2.1		0.000	
	2	4.5	2.9		26.100	
priming out side	2	4	2.9		23.200	
	1	4	3.5		14.000	
priming of ceiling						sq. m
priming inside	4	2.15	2.25		19.350	
	1	0.5	2.25		1.125	
	2	4	2.9		23.200	
	2	3.5	2.9		20.300	
	5	0.6	0.6	0	-1.800	
	1	1	2.1		62.175	
	2	4.5	2.9		26.100	
priming out side	2	4	2.9		23.200	
	1	4	3.5		14.000	
priming of ceiling						sq. m





1086

	Items	No	Length	Width	Height	Quantity	unit
		6				2	Each
	Socket	2					Each
	Elbow (90°)	5					Each
	Stopper Plug	2				1	
	Equal Tee						Each
	End cap					2	Each
	Pipe Clip	1					
	Ewc				0.9	1.08	
		2					Each
	Capacity-5000	3	0.4	0.018			Each
2	Water closet					6	
						2	
3	water storage tank		6			3	
						3	
4	Cistom	2				1	metre
5	Supplying, fitting and fixing 18 mm thick marble partition slab with chawk	3				2	
	doongri marbel	110 MM DIA	3			15	Each
	fitting	1				8	Each
	coupler	2					Each
	plain tee	15				2	Each
	elbo		8			3	Each



1087

	Items	No	Length	Width	Height	Quantity	unit
6	SOIL PIPE	door elbo				1	Each
		plain y type	2			1	metre
		pipe clip	3			20	
		75 MM DIA	1				
		fitting	1				
		coupler	20				
		plain tee					
7	SOIL PIPE	door elbo					
		plain y type					
		pipe clip					

### Cost estimate of septic tank

Sl	item	Qty	Unit	Rate	Amount	Sor
1	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	10.00	sq-mtr	₹ 361.00	₹ 3,610.00	Building Works SOR 2017 Vol-I, Rate Analysis
2	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety i) Ground Floor	5.00	cu-mtr	₹ 5,530.96	₹ 27,654.80	Building Works SOR 2017 Vol-I, Rate Analysis
3	RCC: Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing	0.79	cu-mtr	₹ 7,765.01	₹ 6,146.01	



1088

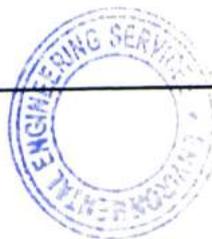
Sl	item	Qty	Unit	Rate	Amount	Sor
	concrete mix following IS 10262 and IS. 456. i) With approved concrete pump.					
4	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work .(Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (e) for every 4 m or part thereof)					Pwd Building work SOR - 2017, P- 36/42(c)(f)
	(a) 25 mm to 30 mm shuttering without staging in foundationaging					
	i) In foundation & ground floor	10.00	Sq-mtr	₹ 209.00	₹ 2,090.00	



Sl	Item	Qty	Unit	Rate	Amount	Sor
5	RCC Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cum of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, i) With approved concrete pump.	0.79	cum	₹ 7,765.01	₹ 6,146.01	Pwd Building work SOR - 2017, P-36/42(c)(f)
6	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, bindees etc.including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL.					Building Work SOR 2017 Vol-I , Page no. 15, item -7(a), 3rd corrigenda
	(a) For works in foundation, basement and upto roof of ground floor/upto 4 m	0.10	M.T	₹ 60,433.00	₹ 6,043.30	
7	Brick work with 1st class bricks in cement mortar (1:4)					Building Work SOR 2017 Vol-I , Page no. 15, item -7(a),
	a) In foundation & plinth	5.00	cu-mtr	₹ 5,483.00	₹ 27,415.00	



Sl	Item	Qty	Unit	Rate	Amount	Sor
8	125 mm thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	2.40	sq mtr	₹ 714.00	₹ 1,713.60	3rd corrigenda
9	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor). [Excluding cost of chipping over concrete surface]					Building Work SOR 2017 Vol-I, Page no 189 item-1(i) a, b, c, 3rd corrigenda
	i) With 1:6 cement mortar. a) 25 mm thick plaster (external)					
	i) In ground floor	50.00	sq-mtr	₹ 187.00	₹ 9,350.00	
10	Neat cement punning about 1.5mm thick in wall, dado, window sill, floor etc. NOTE: Cement 0.152 cu.m per 100 sq.m.	40.00	sq-mtr	₹ 34.00	₹ 1,360.00	Building Work SOR 2017 Vol-I, Page no. 192 item-15
11	Supplying, fitting & fixing UPVC pipes A- Type and fittings conforming to IS:13592-1992 with all necessary clamps nails, including making holes in walls, floor etc. cutting trenches in any soil through masonry concrete structures etc if necessary and mending good damages including joining with jointing materials (Spun Yarn, Valamoid/Bitumen/M-Seal etc) complete.A) UPVC Pipes:	4.00	per/metre	₹ 118.00	₹ 472.00	Building Work SOR 2017 Vol-I, Page no. 212 item-A/(i)



Sl	Item	Qty	Unit	Rate	Amount	SoR
	(i) 75 mm Dia					
	a) Plain Tee (i) 75 mm Dia	2.00	Each	₹ 102.00	₹ 204.00	Building Work SOR 2017 Vol-I , Page no. 212 item-a/(i)
				Sub-Total	₹ 92,204.71	

Sl. No.	Item Description	Quantity	Units	Estimated Rate	Amount (Rs.)	SoR Reference
1	Surface Dressing of the ground in any kind of soil including removing vegetation inequalities not exceeding 15 cm depth and disposal of the rubbish within a lead upto 75 m as directed.	18.00	sq-mtr	₹ 10.00	₹ 180.00	Building Work SOR 2017 Vol-I , Page no.1. item-1
2	Earth work in excavation of foundation trenches or drains, in all sorts of soil (including mixed soil but excluding laterite or sandstone) including removing, spreading or stacking the spoils within a lead of 75 m. as directed. The item includes necessary trimming the sides of trenches, levelling, dressing and ramming the bottom, bailing out water as required complete.	12.00	% cu-mtr	₹ 11,927.00	₹ 1,431.24	Building Work SOR 2017 Vol-I , Page no. 1 item-2(a,b,c)



	a) Depth of excavation not exceeding 1,500 mm					
	b) Depth of excavation for additional depth beyond 1,500 mm. and upto 3,000 mm.	0.00	% cu-mtr	₹ 19,238.00	₹ 0.00	
2	Earth work in filling in foundation trenches or plinth with good earth, in layers not exceeding 150 mm. including watering and ramming etc. layer by layer complete. (Payment to be made on the basis of measurement of finished quantity of work) a) With earth obtained from excavation of foundation.	6.00	% cu-mtr	₹ 7,754.00	₹ 465.24	Building Works SOR 2017; Vol I, p-1 item-3/a
3	Filling in foundation or plinth by silver sand in layers not exceeding 150 mm as directed and consolidating the same by thorough saturation with water, ramming complete including the cost of supply of sand. (payment to be made on measurement of finished quantity)	8.00	% cu-mtr	₹ 76,791.00	₹ 6,143.28	Building Works SOR 2017; Vol I, p-2 item-4
4	Single brick flat soling of picked jhama bricks including ramming and dressing bed to proper level and filling joints with local sand.	14.00	sq-mtr	₹ 355.00	₹ 4,970.00	Building Works SOR 2017 Vol-I, page-14it-1
5	Ordinary Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes. a) Pakur Variety	20.00	cu-mtr	₹ 3,722.00	₹ 74,440.00	Building Works SOR 2017 Vol-I, page-24.it-4/a



	i) Ground Floor				
6	<p>Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification &amp; direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation.</p> <p>i) With approved concrete pump.</p>	14.00	cu-mtr	₹ 5,752.00	₹ 80,528.00
					Pwd Building work SOR -2017, P-33,it 19/ii



7	Hire & labour charges for shuttering with centreing and necessary staging upto 4 m using approved stout and thick hard wood planks of approved thickness with required bracing for concrete slabs, beams, columns, lintels curved or straight including fitting, fixing and striking out after completion of work. (Upto roof of ground floor). (When the height of a particular floor is more than 4 m the equivalent floor height shall be taken as 4 m and extra for works beyond the initial 4 m ht. shall be allowed under 12 (c) for every 4 m or part thereof)					Building Works- SOR 2020, P-42, Item 46 (a)
	(a) 25 mm to 30 mm shuttering without staging in foundationing	90.00	Sq-mtr	₹ 334.00	₹ 30,060.00	
	(b) Steel shuttering or 9 to 12 mm thick approved quality ply board shuttering in any concrete work					Building Works- SOR 2020, P-42, Item 36 ©3th corrigenda
8	Reinforcement for reinforced concrete work in all sorts of structures including distribution bars, stirrups, bindees etc. including supply of rods, initial straightening and removal of loose rust (if necessary), cutting to requisite length, hooking and bending to correct shape, placing in proper position and binding with 16 gauge black annealed wire at every intersection, complete as per drawing and direction. A) Tor steel/Mild Steel i) SAIL / TATA / RINL.					Building Work SOR 2019 Vol-I, Page no. 44, item - 40(a), 10th corrigenda



	(a) For works in foundation basement and upto roof of ground floor/upto 4 m	2.50	M.T	₹ 60,411.00	₹ 151,082.50	
9	Brick work with 1st class bricks in cement mortar (1:4)					Building Work SOR 2017 Vol-I Page no. 15, item 7(a).
	a) In foundation & plinth	6.00	cu-mtr	₹ 5,481.00	₹ 32,898.00	
	b) In superstructure 1st floor.	12.00	cu-mtr	₹ 5,705.00	₹ 68,460.00	
10	125 mm. thick brick work with 1st class bricks in cement mortar (1:4) in ground floor	6.00	sq-mtr	₹ 714.00	₹ 4,284.00	Building Work SOR 2017 Vol-I Page no. 16 item-16
11	Plaster (to wall, floor, ceiling etc.) with sand and cement mortar including rounding off or chamfering corners as directed and raking out joints including throating, nosing and drip course, scaffolding/staging where necessary (Ground floor).[Excluding cost of chipping over concrete surface]					Building Work SOR 2017 Vol-I Page no. 189 item-1
	i) With 1:6 cement mortar.					
	a) 25 mm thick plaster ( external )					
	i) In ground floor	23.20	sq-mtr	₹ 187.00	₹ 4,338.40	
	b) 15 mm thick plaster (internal) 1:4 cement mortar					
	i) In ground floor	62.50	sq-mtr	₹ 156.00	₹ 9,750.00	
	c) 10 mm thick plaster					
	i) In ground floor	14.00	sq-mtr	₹ 126.00	₹ 1,764.00	



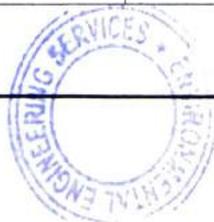
12	18 mm. to 22 mm thick, kota stone slab set in 20 mm thick (avg) cement mortar (1:4) in floor, stair & lobby including pointing in cement slurry with admixture of pigment matching the stone shade, including grinding & polishing as per direction of Engineer - in - charge to match with the existing work. [Slurry for bedding @ 4.4 kg/Sq.m and pointing @2.0 kg/Sq.m]	17.60	Sq-mtr	₹ 1,010.00	₹ 17,776.00	Building Work SOR 2017 Vol-I Pg-54, It-17
13	Supplying, fitting & fixing best quality digital printed Ceramictiles in coloured decorative on walls and floors to match with the existing work & 4 nos. key stones (10mm) fixed with adhesive 4.5 mm thick at the back of each tile & finishing the joints with white cement mixed with colouring oxide if required to match the colour of tiles including roughening of oncrete surface, if necessary or by synthetic adhesive & grout materials etc. With polymerised adhesive and epoxy grout pointing including spacer - 2mm (When tiles are laid over existing hard ready surface) all complete as per direction of Engineer-in-charge.	51.96	Sq-mtr	₹ 1,060.00	₹ 55,077.60	Building Work SOR 2017 Vol-I Pg-68, It-39
14	Neat cement punning about 1.5 mm. thick in wall, dado, window, sills, floor, drain etc. NOTE : Cement 0.152 cu.m. per 100 sq.m.	10.20	sq-mtr	₹ 34.00	₹ 346.80	Building Work SOR 2017 Vol-I Pg-192, It-15



15	Supplying, fitting and fixing Stainless Steel railing consist of 38mm dia and 900mm height vertical balustrade at every two alternative steps, 50mm dia top rail, 3 (three) nos 19mm dia horizontal Stainless steel pipe and base/cover plate with Strainless Steel GRADE 304 containing 7.5% nickle (Interior Grade) Brushed/Matfinish, complete as per direction of the Engineer-in-charge. Weight of Strainless Steel railing per metre 6.5 Kg (approx)	5.40	per metre	₹ 7,677.00	₹ 41,455.80	Building Works SOR - 2017, Pg- 109 / It-22
16	Wood work in door and window frame fitted and fixed in position complete (c) Sal : Siliguri.	0.20	cu-mtr	₹ 98,112.00	₹ 19,622.40	Building Works SOR - 2017, Pg- 114 / It- 1/c
17	Panel shutters of door and window, as per design (each panel consisting of single plank without joint), including fitting and fixing the same in position but excluding the cost of hinge and other fittings. In ground floor. (In case of non-supply of single plank, penal rate of reduction of 20% will be made)(ii) 40mm thick shutters with 19mm thick panel of size 30 to 45 cm . (b) Sishu, Gamar, Champ, Badam, Bhola, Mogra, allak.	6.00	sq-mtr	₹ 3,143.00	₹ 18,858.00	Building Works SOR - 2017, Pg- 117 / It- 1/ii/b
18	Supplying, fitting and fixing M.S. clamps for door and window frame made of flat bent bar, end bifurcated with necessary screws etc. by cement concrete(1:2:4) as per direction. (Cost of concrete will be paid separately)(a) 40mm X 6mm, 250mm Length	18.00	Each	₹ 29.00	₹ 522.00	Building Works SOR - 2017, Pg- 140 / It- 4/a



19	Iron butt hinges of approved quality fitted and fixed with steel screws, with ISI mark (vii) 100mm X 58mm X 1.90mm.	18.00	Each	₹ 47.00	₹ 846.00	Building Works SOR - 2017, Pg- 140 / It- 5/vii
20	Iron socket bolt of approved quality fitted and fixed complete(c) 150mm long x 10mm dia bolt.	6.00	Each	₹ 63.00	₹ 378.00	Building Works SOR - 2017, Pg- 141 / It- 8/c
21	i) Iron hasp bolt of approved quality fitted and fixed complete (oxidised) with 16mm dia rod with centre bolt and round fitting.(b) 250mm long.	3.00	Each	₹ 169.00	₹ 507.00	Building Works SOR - 2017, Pg- 141 / It- 10/b
22	Rendering the Surface of walls and ceiling with White Cement base WATER PROOF wall putty of approved make & brand.(1.5 mm thick)	62.50	sq-mtr	₹ 122.00	₹ 7,625.00	Building Works SOR - 2017, Pg- 198 / It-5
23	Louvered window.i) Top, bottom and side member.	7.20	metre	₹ 196.00	₹ 1,411.20	Building Works SOR - 2017, Pg- 238 / It- h/i
24	1 Supplying profiles of required section made of Aluminium Alloy Extrusions conforming to IS: 732-1983 and IS: 1285- 1975; Anodized (with required film thickness and specified colour / natural) matt finished conforming to IS: 1868-1983 for fabrication of composite door, sliding & casement windows, partitions, formed of basic sections of any ISI embossed / certified make and	7.20	metre	₹ 311.00	₹ 2,239.20	Building Works SOR - 2017, Pg- 233/ It-1/b



	brand as per direction of Engineer - In-Charge. (Payment will be made on finished length of the work).b) 3- track sliding window					
25	<p>Supplying and affixing optically clear polyester sun control window film having acrylic pressure sensitive adhesive on one side &amp; an acrylicabrasion resistant coating on the other, with composition of infrared absorbing carbon &amp; free from any optical defect. The filmcharacteristics should conform to ASTM E308, ASTM E903, ASTM E84 and ASHIRAE. The film should be pasted after preparatory works without any cracking, delamination, bubbling, scoloring andvariation in total transmission of light across the width at any portion along the length doesn't exceed 2% over the average including scaffolding &amp; relevant others to complete in all respect as permanufacturer's specification &amp; direction of Engineer -in-Charge.(Note: This work should not be executed without specific permission of Superintending Engineer)(b) Superior Quality : Film Thickness - 2.0 Mil, Glare Reduction &gt; 75%, U factor &lt; 1.03, Emissivity &lt; 0.70</p>	15.00	sq-mtr	₹ 544.00	₹ 8,160.00	Building Works SOR - 2017, Pg- 206 / It- 8/b



26	(a) Priming one coat on steel or other metal surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	62.18	sq-mtr	₹ 29.00	₹ 1,803.08	Building Works SOR - 2017, Pg- 200 / It- 1/a
27	(b) Priming one coat on timber or plastered surface with synthetic oil bound primer of approved quality including smoothening surfaces by sand papering etc.	0.00	sq-mtr	₹ 38.00	₹ 0.00	Building Works SOR - 2017, Pg- 200 / It- 1/b
28	(b) Priming one coat on timber or plastered surface with synthetic oilbound primer of approved quality including smoothening surfaces by sandpapering etc.	1.13	sq-mtr	₹ 38.00	₹ 42.75	Building Works SOR - 2017, Pg- 200 / It- 1/b
29	(A) Painting with best quality synthetic enamel paint of approved make and brand including smoothening surface by sand papering etc. including using of approved putty etc. on the surface, if necessary :(iv) Two coats (with any shade except white)	1.13	sq-mtr	₹ 81.00	₹ 91.13	Building Works SOR - 2017, Pg- 200 / It- 1/b
30	Sanitary plumbing					



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31	<p>Supplying, fitting and fixing CPVC (Chlorinated Polyvinyl Chloride) pipes of approved make conforming to IS-15778: 2007 . with all necessary accessories, specials viz. socket, bend, tee, union, cross, elbo, nipple, long screw, reducing socket, reducing tee, short piece etc. fitted with holder bats clamps, including cutting pipes, fitting, fixing etc. complete in all respect including cost of all necessary fittings as required, jointing materials in any position above ground. (Payment will be made on the centre line measurements of total pipe line including all specials. No separate payment will be made for accessories, specials.</p>				₹ 135,000.00	
Sub-Total					₹ 782,557.00	

  
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## 8 Operation and Maintenance

### 8.1 O&M cost for 15 years

Appropriate budgetary provisions for the O&M of sewerage system need to be provided so that O&M is carried out without any constraints such as human resources and finance. An interception and diversion system consists of the following

- **Sewers** These are pipes or conduits meant for carrying sewage and are laid along the roads and flow by gravity.
- **Lift Stations** When sewers are at a deeper depth, lift stations are used which help to move sewage from lower elevations below the ground to the required higher elevation;
- **Pump Stations** They transfer the sewage from one location to another;
- **Sewage Treatment Plants** They treat the sewage to meet the permitted discharge qualities.
- Safe disposal system of final effluent

### 8.2 Annual O&M Cost of Works

#### 8.2.1 Annual manpower cost

Average annual maintenance cost is taken as 0.25% the cost of rising mains and effluent lines.

- (i) Sewage Pumping Station:
  - a. Plant Operator 3 No @ Rs. 15,000.00 p.m. and 1 no Mechanic 1 no Electrician @ Rs. 3000.00 p.m
- ii. Total Monthly Remuneration =  $(3 \times 15000) + (2 \times 3000)$
- iii. = Rs. 51,000.00 p.m.
- iv. So, annual manpower cost will be =  $(12 \times 51000) = \text{Rs. } 6, 12,000.00$

For 2 Pumping Stations, total annual manpower cost will be

$$= (2 \times \text{Rs. } 6, 12,000.00)$$

$$= \text{Rs. } 12, 24,000.00$$

SL No	ITEM	QTY	MONTH	RATE	AMOUNT
	Expenditure on STAFF				
1	Plant Operator	3	12	₹ 15,000.00	₹ 540,000.00
	Mechanic	1	12	₹ 3,000.00	₹ 36,000.00
	Electrician	1	12	₹ 3,000.00	₹ 36,000.00
Total					612,000.00



v. (ii) STPs

Sl. No	ITEM	QTY	MONTH	RATE	AMOUNT
1	Expenditure on STAFF				
	Helpers	2	12	₹ 15,000.00	₹ 3,60,000.00
Total					

vi. So, annual manpower cost will be =  $(2 \times 12 \times 360) = \text{Rs. } 3,60,000.00$

### 8.2.2 Annual cost of power

The operation of the plant and other pumping stations are closed for 4 months at the time of monsoon. So it will be open for  $365 - 120 = 245$  days on average.

(i) Sewage Pumping Station of 1.5 MLD:

Power Consumption charges

Sl No	Equipment	HP Installed	W	S	T	BKW	Hrs/day	KW-hr/day	
1	Pump type – I	2	1	1	2	1.4925	8	11.940	
2	Pump type – II	3	1	1	2	2.2388	10	22.388	
3	Pump type – II	7	1	0	1	5.2239	6	31.343	
4	Miscellaneous	3% of Total 65.6716417910448 KW							1.970
TOTAL								67.642	

Taking the cost of electricity Rs. 12.0/KW-hr; Total Annual Cost will be

$$= (67.65 \times 245 \times 12)$$

$$= ₹ 198,867.00$$

Diesel charges for DG

Sl No.	Item	Liters of Diesel /Hour	Quantity /Month (Hrs)	Month	Present Diesel Rate	Amount
1	Diesel Generator 45 KVA	12	15	12	₹ 77.41	₹ 167,205.60



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Assuming DG will be running for 1/2hr everyday

(ii) Sewage Pumping Station of 7.5 MLD

Power Consumption charges

Sl No	Equipment	HP Installed	W	S	T	BKW	Hrs/day	KW-hr/day	
1	Pump type - I	8	1	1	2	5.9701	8	47.761	
2	Pump type - II	16	1	1	2	11.9403	10	119.403	
3	Pump type - III	36	1	0	1	26.8657	6	161.194	
4	Miscellaneous	3% of Total 328.358208955224 KW							9.851
	TOTAL								338.209

Taking the cost of electricity Rs. 12.0/KW-hr; Total Annual Cost will be

$$= (338.21 \times 245 \times 12)$$

$$= ₹ 994,335.00$$

Diesel charges for DG

Sl No.	Item	Liters of Diesel /Hour	Quantity /Month (Hrs)	Month	Present Diesel Rate	Amount
1	Diesel Generator 250 KVA	61	15	12	₹ 77.41	₹ 849,961.80

Assuming DG will be running for 1/2hr everyday

vii.

### 8.2.3 Annual expenditure on repairs and maintenance

Average annual maintenance cost is taken as 0.25% the cost of rising mains and effluent lines.

(i) Annual operation and maintenance cost for Diversion/Interception sewers will be –

- 0.25% of Rs ₹ 1,309,508.16

-Rs. 3273.77

(ii) Annual operation and maintenance cost for Gravity sewers, Manholes & Rising mains will be -

- 0.25% of Rs. (35,722,611.55 + 12,200,987.46)

-Rs. ₹ 119,808.99

(iii) Pumping Stations:

Sewage Pumping Station of 1.5 MLD:

a. Removal Of Silt, Slush, Muck Or Any Other Foul Material (Rs. 383.23 per Cum)

= 0.5m Depth of Sludge Generated in 1 year at 4.2m Diameter with 10% Extra for safety

$$= (1.1 \times 0.5 \times 0.25 \times \pi \times 4.2 \times 4.2) = 7.7 \text{ Cum}$$

Total Removal cost annually will be (7.7 X 383.23)

= Rs. 2950.88

b. Average annual maintenance cost is taken as 1% of Civil

$$= 1\% \times \text{Rs. } 6040756.61 = \text{Rs. } 60407.57$$

c. Average annual maintenance cost is taken as 1% of Electrical and Mechanical Works Capital Cost

$$= 1\% \times \text{Rs. } 8047952 = \text{Rs. } 80479.52$$

Sewage Pumping Station of 7.5 MLD:

a. Removal Of Silt, Slush, Muck Or Any Other Foul Material (Rs. 383.23 per Cum)

= 0.5m Depth of Sludge Generated in 1 year at 5.7m Diameter with 10% Extra for safety

$$= (1.1 \times 0.25 \times 0.5 \times \pi \times 5.7 \times 5.7) = 14.05 \text{ Cum}$$

Total Removal cost annually will be (14.1 X 383.23)

= Rs. 5403.55

b. Average annual maintenance cost is taken as 1% of Civil

$$= 1\% \times \text{Rs. } 8606658 = \text{Rs. } 86066.58$$

c. Average annual maintenance cost is taken as 1% of Electrical and Mechanical Works Capital Cost

$$= 1\% \times \text{Rs. } 9715801.12 = \text{Rs. } 97158.02$$



(v)

(vi) STPs

a. Average annual maintenance cost is taken as 5% of Civil Works Capital Cost

(v)

5% X Rs. 2,47,80,495.61 = Rs. 12,39,024.78

(vi)

So, Total Annual maintenance cost for STPs

= Rs. 12,39,024.78

### 8.2.4 Abstract of annual O&M Cost

Components	Interception Works	Diversion/ Interception Sewers	Gravity Sewer, Manholes & Rising Mains	Sewage Pumping Stations	Waste Stabilization Pond	Total
Manpower	₹ 0.00	₹ 0.00	₹ 0.00	₹ 1,224,000.00	₹ 360,000.00	₹ 1,584,000.00
Electricity	₹ 0.00	₹ 0.00	₹ 0.00	₹ 2,210,369.40	₹ 0.00	₹ 2,210,369.40
Repair & Maintenance	₹ 0.00	₹ 3,273.77	₹ 116,929.49	₹ 332,466.10	₹ 1,062,798.05	₹ 1,515,467.42
Residual Disposal	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
Chemical	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00	₹ 0.00
Total	₹ 0.00	₹ 3,274.00	₹ 116,930.00	₹ 3,766,835.50	₹ 1,422,798.05	₹ 5,309,836.82

## 8.3 O&M Cost Break-up for 15 Years

Above O&M Cost has calculated for current year, taking current rate of items. For increase in rate in future years a certain percentage is multiplied with the value as increment. As per NMCG guideline the increment rate is as follows:

1st Two Years: 5.00%

Next Three Years: 5.00%

Next Three Years: 5.00%

Next Three Years: 5.00%

Next Three Years: 5.00%

A detail table has given below to understand the operation & maintenance cost of entire project for 15 years after the completion of construction.



### O&M Cost for 15 years

YEAR	Increment/Year	O&M Cost - Pipe Line	O&M Cost - Pump Stations	O&M Cost - Waste Stabilization Pond	Total
1st		₹ 120,204.00	₹ 3,766,835.50	₹ 1,422,798.05	₹ 5,309,837.56
2nd	5%	₹ 126,214.20	₹ 3,955,177.28	₹ 1,493,937.96	₹ 5,575,329.44
3rd	5%	₹ 132,524.91	₹ 4,152,936.14	₹ 1,568,634.85	₹ 5,854,095.91
4th	5%	₹ 139,151.16	₹ 4,360,582.95	₹ 1,647,066.60	₹ 6,146,800.70
5th	5%	₹ 146,108.71	₹ 4,578,612.10	₹ 1,729,419.93	₹ 6,454,140.74
6th	5%	₹ 153,414.15	₹ 4,807,542.70	₹ 1,815,890.92	₹ 6,776,847.77
7th	5%	₹ 161,084.86	₹ 5,047,919.84	₹ 1,906,685.47	₹ 7,115,690.16
8th	5%	₹ 169,139.10	₹ 5,300,315.83	₹ 2,002,019.74	₹ 7,471,474.67
9th	5%	₹ 177,596.05	₹ 5,565,331.62	₹ 2,102,120.73	₹ 7,845,048.41
10th	5%	₹ 186,475.86	₹ 5,843,598.20	₹ 2,207,226.77	₹ 8,237,300.83
11th	5%	₹ 195,799.65	₹ 6,135,778.11	₹ 2,317,588.10	₹ 8,649,165.87
12th	5%	₹ 205,589.63	₹ 6,442,567.02	₹ 2,433,467.51	₹ 9,081,624.16
13th	5%	₹ 215,869.11	₹ 6,764,695.37	₹ 2,555,140.89	₹ 9,535,705.37
14th	5%	₹ 226,662.57	₹ 7,102,930.14	₹ 2,682,897.93	₹ 10,012,490.64
15th	5%	₹ 237,995.70	₹ 7,458,076.64	₹ 2,817,042.83	₹ 10,513,115.17
	Total	₹ 2,593,829.66	₹ 81,282,899.45	₹ 30,701,938.28	₹ 114,578,667.38

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## 9 Cost Sharing pattern

National Green Tribunal issued Order dated-30.09.2020 [O.A.No.06/2016/EZ] for abatement of pollution at Santragachi Jheel indicating that the Cost for setting up of STP/garland drains and its maintenance will be proportionately shared between SER and HMC.

Accordingly, the following are derived:

Authority	Outfall no.	Sewage Generation (MLD)	Total Sewage generation (MLD)
RAILWAY	OF-1,2,3,4, 5.1, 5.2, 5.3, 43, 44,45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55	0.97	1.5
HMC	OF-6 to OF-42	0.525	

As per above flow generation between South Eastern Railway and Howrah Municipal Corporation has been shown that it is 65: 35. Cost Sharing pattern of the Project will be proportionately is 65:35 on the basis of above flow distribution. Total cost will be 18.31 Cr for South Eastern Rail way and 9.86 Cr for Howrah Municipal Corporation.



## 10 Proposed Work Programme:BAR Chart

10.1 Name of Work: Construction of Interception & Diversion (I&D) network for existing drain falling in Santragachi Jheel for Pollution abatement



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# RATE ANALYSIS



## Rate for supply of different sizes of Stone Materials at Satragachi Jheel.

Ref: P.W.D® of 2018 W.E.F - 30.08.2018

Rate / Unit in different materials (in Rs)

Sl. No	Name of The Railway Yards	Unit	26.5 mm	22.4 mm	13.2 mm	11.2 mm	5.6 mm	Stone Agg. 37.5 mm	Stone Dust mixed with grit	Stone Grit	40 mm nominal size	20 mm nominal size	10 mm nominal size
1	Rate of Pakur stone at Salimar Railway Yard (Cost of Materials) Ref PWD* - P - 226, Table III-2	Cu. M	1476.00	1491.00	1514.00	1375.00	1122.00	1417.00	1008.00	1022.00	1439.00	1430.00	1299.00
<b>SUB TOTAL (A)</b>		Cu. M	1476.00	1491.00	1514.00	1375.00	1122.00	1417.00	1008.00	1022.00	1439.00	1430.00	1299.00
2	(B) Add Overhead Charges @5% on Sub Total (A)	Cu. M	73.80	74.55	75.70	68.75	56.10	70.85	50.40	51.10	71.95	71.50	64.95
3	(C) Add Contractor's Profit @10% on Sub Total (A+B)	Cu. M	154.98	156.56	158.97	144.38	117.81	148.79	105.84	107.31	151.10	150.15	136.40
4	Loading, Unloading and Stacking (Ref. It: 1.03 (c)&(d),P-225)	Cu. M	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00	77.00
5	Less Stacking @ 25.00%.	Cu. M	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25	-19.25
6	Carrriage cost from Salimar Railway Yards to work Site Area (Considering Distance=7.0 Km) , (Ref P - 230, Tb: I)												
a	Upto 5.0 Km	Cu. M	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00	124.00
b	Above 5 km up to 10 km (per km)	Cu. M	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80	21.80
<b>Total Rate Per Cu.M</b>			<b>1,908.33</b>	<b>1,925.66</b>	<b>1,952.22</b>	<b>1,791.68</b>	<b>1,499.46</b>	<b>1,840.19</b>	<b>1,367.79</b>	<b>1,383.96</b>	<b>1,865.60</b>	<b>1,855.20</b>	<b>1,703.90</b>

  
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### ANALYSIS OF COST OF BITUMEN

Ref: P.W.D(Roads & Bridge) of 2018 W.E.F - 30.08.2018

Rate per M.Ton

Step	Descriptions	Bitumen (Packed) : VG-30 (60/70) [W.E.F-30.08.2018] [HALDIA]	Bituminous Emulsion (Packed) M5 Type [W.E.F-30.08.2018] [DHULAGARH]
1	Rate for Bitumen ( PWD (ROADS) 2018 Page 219, TABLE NO 12 of W.E.F 30.08.2018 , 9th corrigenda , TABLE NO 12 , item no 4 & 9)	32,180.00	28,500.00
	<b>SUB TOTAL (A)</b>	32,180.00	28,500.00
2	(B) Add Overhead Charges @5% on Sub Total (A)	1,609.00	1,425.00
3	(C) Add Contractor's Profit @10% on Sub Total (A+B)	3,378.90	2,992.50
4	(1) Carriage cost from Haldia to Work site (satragachi jheel) (Considering Distance= 111.0 Km) , (Ref P-231 , Sl-11, Table 1, Zone A)		
	(a) Upto 100.00 Km	654.50	-
	(b) Above 100 km up to 200 km (11 km @ Rs. 5.30 per Km)	58.30	-
	(2) Carriage cost from Dhulagarh to Work Site (Considering Distance= 16.0 Km) , (Ref P-231 , Sl-11, Table: 1, Zone:A) (40 km @ Rs. 654.50 per 100 Km)		104.72
5	Deduction of cost of container @ Rs. 1000.0 / MT Vide Page No. 2, Note- I(3).	-1,000.00	-1,000.00
	<b>FOR ANALYSIS OF COST OF BITUMEN PER MT</b>	36,880.70	32,022.22

### ANNEXURE E

Rate for Prime Coat (Rate per Sq. m)

Ref: P.W.D® of 2018 W.E.F - 30.08.2018

On For WBM / WMM Surface @ 0.70-1.0 kg per Sq. m

Sl. No	Description		
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**ANNEXURE F****Rate for Tack Coat (On Bituminous Surface) (Rate per Sq. m)****Ref: P.W.D® of 2018 W.E.F - 30.08.2018****On For WBM / WMM Surface @ 0.70-1.0 kg per Sq. m**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision). (Ref.P-251,It No-5.02(ii))	Sq. m	1.00	1.30	1.30
2	<b>Materials: (Ref.P-213 of Table: 3.3-1)</b>				
	Cataionic Emulsion	MT	0.00025	32,022.22	8.01
<b>Rate per Sq. m = Rs</b>					<b>9.31</b>

**Rate for Tack Coat (On Granular surfaces treated with primer) (Rate per Sq. m)****Ref: P.W.D® of 2018 W.E.F - 30.08.2018****On For WBM / WMM Surface @ 0.70-1.0 kg per Sq.m**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Providing and applying tack coat with Cationic Bitumen Emulsion of approved grade conforming to IS: 8887-1978 on the prepared surface cleaned with Hydraulic broom, moistening the surface including cost and carriage of emulsion, hire charges of machinery and labour, cost of fuel and lubricants all complete as per Clause 503 of Specifications for Road & Bridge Works of MoRT&H (5th Revision). (Ref.P-251,It No-5.02(i))	Sq. m	1.00	1.30	1.30
2	<b>Materials: (Ref.P-213 of Table: 3.3-1)</b>				
	Cataionic Emulsion	MT	0.000275	32,022.22	8.81
<b>Rate per Sq. m = Rs</b>					<b>10.11</b>

  
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**ANNEXURE G****Bituminous Macadam using Mobile Hot Mix Plant (Light Duty) for Grading 2  
(19 mm nominal size, 50-75 mm thick.)****Ref: P.W.D<sup>o</sup> of 2018 W.E.F - 30.08.2018****Unit per Cu.M**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Providing and laying bituminous macadam with Mobile Hot Mix Plant (Light Duty) using approved crushed aggregates of specified grading as per Table 500.7 premixed with bituminous binder, transported to site laid over a previously prepared surface at specified laying temperature by means of approved and suitable arrangements to the required grade, level and alignment and rolled with suitable power roller for break down, inter-mediate and finished rolling as per specification to achieve the desired compaction including cost and carriage of stone materials and bitumen, hire charges of machinery and equipment, cost of fuel and lubricants and wages of operational staff, quality control complete as per Specifications for Road & Bridge Works of MoRT&H (5th Revision). (Ref.P-252, It No-5.04 (B))	Cu.m	1.00	940.00	940.00
2	<b>Materials:(Ref. P-213 , It No. 5.03 (B))</b>				
a	Bitumen(Packed/bulk)	M.T.	0.0750	36,880.70	2766.05
b	22.4 mm Stone Chips(30%)	Cu.m	0.4241	1,925.66	816.67
c	13.2 mm Stone chips(20%)	Cu.m	0.2827	1,952.22	551.89
d	11.2 mm Stone Chips(25%)	Cu.m	0.3534	1,791.68	633.18
e	5.6 mm Stone Chips(15%)	Cu.m	0.2121	1,499.46	318.04
f	Stone Dust(10%)	Cu.m	0.1414	1,367.79	193.41
<b>Rate Per Cu. M</b>					<b>6,219.23</b>

  
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**ANNEXURE H**

**Open-Graded Premix Surfacing using Viscosity grade Paving Bitumen and HMP  
Using Batch Type HMP of minimum capacity 100-120 TPH.**

**Ref: P.W.D<sup>o</sup> of 2018 W.E.F - 30.08.2018**

**Unit per Sq. M**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Providing, laying and rolling of Open graded premix surfacing of 20 mm thickness composed of 13.2 mm (@ 0.018 m <sup>3</sup> per m <sup>2</sup> ) and 11.2 mm (@ 0.009 m <sup>3</sup> per m <sup>2</sup> ) size stone aggregates, including thoroughly cleaning of the surface, screening, cleaning and pre-heating stone chips and fully pre-coating the same either using viscosity grade paving bitumen or cut back or emulsion, carrying the mixture by tipper trucks or by any other suitable arrangements, laying the mixture uniformly over the surface with paver finisher, including manual operations as and when required for proper line, grade and level to serve as wearing course on a previously prepared base, including mixing in Hot Mix Plant and thoroughly rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades including the cost and carriage of stone chips and matrix, heating the matrix, preheating the aggregates to required temperature and including the hire charges of Hot Mix Plant and other machinery, pay of operators, cost of fuel and lubricants etc. complete as per Clause 510 of Specifications for Road & Bridge Works of MoRT&H (5th Revision). (Ref P-256, It No-5.10(i))	Sq.m.	1.00	24.10	24.10
2	<b>Materials:(Ref. P-214, It No. 5.10)</b>				
a	Bitumen(Packed/bulk)	M.T.	0.00146	36,880.70	53.85
b	13.2 mm Stone Chips(20%)	Sq.m	0.018	1,952.22	35.14
c	11.2 mm Stone Chips(25%)	Sq.m	0.009	1,791.68	16.13
<b>Rate Per Sq. M.</b>					<b>129.21</b>

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**ANNEXURE I**

**Seal Coat by Mechanical Means with Hot Bitumen Binder**  
**(@ 6.80 kg / 10 sq. m.)**

**Ref: P.W.D® of 2018 W.E.F - 30.08.2018**

**Unit per Sq. M**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Providing and laying Premixed Seal Coat (Type B) with approved quality sand/grit @ 0.6 m <sup>3</sup> / 100 m <sup>2</sup> and bitumen binder on thoroughly cleaned black top surface coated with tack coat, including heating and mixing cleaned sand/grit (100 % passing through 2.36 mm sieve and retained on 180 micron sieve) uniformly with bitumen binder, laying and spreading the mix at an uniform rate using suitable means, brushing the surface, if necessary, to ensure uniformity, followed by rolling with power roller including the cost and carriage of binder and aggregates, cost of heating the binder and aggregates and all other incidental charges, cost of fuel and lubricants, including hire charges of machineries, tools & plants required for construction and quality control complete as per Clause 511 of Specifications for Road & Bridge Works of MoRT&H (5th Revision). (Ref.P-258,It No-5.13 (B)(I)(i))	Sq.m.	1.00	7.00	7.00
2	<b>Materials:(Ref. P-214, It No. 5.13(ii))</b>				
a	Bitumen(Packed/bulk)	M.T.	0.00068	36,880.70	25.08
b	stone grit	Sq.m	0.006	1,383.96	8.30
<b>Rate Per Sq. M,</b>					<b>40.38</b>

*AS*  
**Executive Engineer**  
 WB-I/GAP/W&B Sector,  
 2018/19/1



1118

**ANNEXURE C**

**Granular Sub-base with Graded Material**  
**Construction of Sub Base using Local Materials:**  
**Ref: P.W.D<sup>®</sup> of 2018 W.E.F - 30.08.2018**  
**Unit per Cu. M**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Construction of Sub Base using Local Materials, spreading in uniform layers with Motor grader on prepared surface, including screening the metal as necessary, mixing by mix in place method with Rotavator at OMC, and compacting with vibratory roller to achieve the desired density, lighting, guarding and barricading including cost and carriage of all materials and making necessary earthen bundh of one metre wide on each side to protect the edges complete as per Clause 401 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)	Cu.m	1.00	317.00	317.00
	(i) For Construction of Sub Base by compacting 1 <sup>st</sup> class brick aggregates (40 mm down) and sand (in proportion of 60:40). (Vide Page: 247, It No. 4.09(i))				
2	Materials:(Ref. P-222 TABLE II-1)				
a	Brick Aggregates (40 mm down)	Cu.m	0.90	1386.00	1247.40
b	Medium Sand	Cu.m	0.48	1180.00	566.40
<b>Rate Per Cu.M</b>					<b>2,130.80</b>

**ANNEXURE D**

**Water Bound Macadam Sub Base**  
**Ref: P.W.D<sup>®</sup> of 2018 W.E.F - 30.08.2018**  
**Unit per Cu.M**

Sl. No	Description	Unit	Quantity	Rate(Rs)	Amount (Rs)
1	Water Bound Macadam Sub Base by consolidating Jhama metal / Laterite chelly or stone metal /shingles of specific size in hard crust to requisite thickness (measured after compaction) in layers including screening of metals etc. as necessary, hand packing, sweeping, watering and rolling in stages with power roller to proper line, grade and camber, lighting, guarding & barricading and making necessary earthen bundh of one metre width on each side where necessary to protect edges and preparing the bed by necessary cutting or filling and rolling all complete including the cost of all materials and hire and labour charges of all men and machineries and compacting to the required density, as per Clause 404 of Specifications for Road & Bridge Works of MoRT&H (5th Revision).	Cu.m	1.00	408.00	408.00
	(i) For Construction of Sub Base by consolidating Jhama metal (63 mm to 45 mm) with moorum screening :(Vide Page: 247, It No. 4.10(i))				
2	Materials:(Ref. P-222 TABLE II-1)				
a	Jhama metal	Cu.m	1.09	1667.00	1817.03
b	moorum screening (vide Annexure - 0)	Cu.m	0.26	2011.75	523.06
<b>Rate Per Cu.M</b>					<b>2,748.09</b>



*[Signature]*  
**Executive Engineer**  
 W&B Sector

1119

**ANNEXURE O****Rate for supply of different sizes of Stone Materials at Satragachi Jheel****Ref: P.W.D® of 2018 W.E.F - 30.08.2018****Rate / Unit in different materials (in Rs)**

Sl. No	Description	Unit	Rs.
1	Moorum (at Quarry) at West Medinipur	Cu M	117.00
2	Loading, Unloading and Stacking (Ref. It: 1 03Aa,P-227)	Cu M	62.00
3	Less Stacking @ 25.00%	Cu M	-20.75
4	Carriage cost from West Medinipur (at Quarry) to work site (Considering Distance= 210.0 Km) , (Ref. P - 230, Tb. I)		
a	Upto 5.0 Km	Cu M	124.00
b	Above 5 km up to 10 km (per km)	Cu M	54.50
c	Above 10 km up to 20 km (per km)	Cu M	101.00
d	Above 20 km up to 50 km (per km)	Cu M	285.00
e	Above 50 km up to 100 km (per km)	Cu M	420.00
f	Above 100 km (per km)	Cu M	869.00
<b>Total Rate Per Cu.M</b>			<b>2,011.75</b>



*[Signature]*  
Executive Engineer  
WB-I/GAP/W&B Sector,  
KMDA

## Analysis of Rate for Controlled Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

#### [Pg.-24, It.-5(i) of P.W.D. (Bldg.) of Schedule of Rates] with 3rd corrigendum

Controlled Cement concrete with well graded stone chips (20 mm graded nominal size) excluding shuttering and reinforcement with complete design of concrete as per IS : 456 and relevant special publications, submission of job mix formula after preliminary mix design after testing of concrete cubes as per direction of Engineer-in charge. Consumption of cement will not be less than 300 Kg of cement with Super plasticiser per cubic meter of controlled concrete but actual consumption will be determined on the basis of preliminary test and job mix formula. In ground floor and foundation. [using concrete mixture]

#### **M 20 Grade**

(i) Pakur Variety = Rs. 4547.00

Quantity of Cement = 0.286 cum.

Issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.286 \times 1.428 \times 6460.00 = \text{Rs.}$  2638.32

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 0.286 \times 1.428 \times 5873 = \text{Rs.}$  2638.44

### [B] Cost of stone aggregates including carriage

#### 20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs. 1855.03 x 0.54 = Rs. 1001.72

#### 10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs. 1703.90 x 0.36 = Rs. 613.404

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size = 0.90 cu.m. x Rs. 58.00 = Rs. 52.20

**Rate for 1 cu.m. (M20) concrete = Rs. 6214.44**



*[Signature]*  
**Executive Engineer**  
**WB-1/GAP/W&B Sector,**  
**K.M.D.A.**

## Analysis of Rate for Controlled Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

[Pg.-25, It.-6(i) of P.W.D. (Bldg.) of Schedule of Rates] with 3rd corrijendam.

Controlled Cement concrete with well graded stone chips (20 mm nominal size) excluding shuttering and reinforcement with complete design of concrete as per IS - 456 and relevant special publications, submission of job mix formula after preliminary mix design after testing of concrete cubes as per direction of Engineer in charge. Consumption of cement will not be less than 300 Kg of cement with Super plasticiser per cubic meter of controlled concrete but actual consumption will be determined on the basis of preliminary test and job mix formula. In ground floor and foundation [using concrete mixture]

#### **M 25 Grade**

(i) Pakur Variety = Rs. 4886.00

Quantity of Cement = 0.286 cum.

issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.286 \times 1.428 \times 6460.00 =$  Rs. -2638.32

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.286 \times 5873 =$  Rs. 2638.44

### [B] Cost of stone aggregates including carriage

20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $Rs. 1855.03 \times 0.54 =$  Rs. 1001.72

10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $Rs. 1703.90 \times 0.36 =$  Rs. 613.404

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size =  $0.90 \text{ cu.m.} \times Rs. 58.00 =$  Rs. 52.20

**Rate for 1 cu.m. (M25) concrete =** Rs. 6553.44



Executive Engineer  
WB-1/GAP/W&B Sector,  
K.M.D.A.

## Analysis of Rate for Ready mix Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

Supplying ready mixed concrete of **M 20** Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following IS 10262 and IS 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [Cement to be supplied by the Manufacturer or supplier]

5196

#### **i) Without approved concrete pump.**

It. No. 18(i) page-32 of PWD (B)-2017, with 3 rd corrigendum & Addendum dt. 04.06.2018, rate analysis.

considering cement content = 450 kg/cu.m

Quantity of Cement = 0.45 MT.

issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.45 \times 1.428 \times 6460.00 = \text{Rs.}$

-4151.20

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.45 \times 5873 = \text{Rs.}$

4151.39

### [B] Cost of stone aggregates including carriage

#### 20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs.  $1855.03 \times 0.54 =$

Rs.

1001.72

#### 10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs.  $1703.90 \times 0.36 =$

Rs.

613.404

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size = 0.90 cu.m. x Rs. 58.00 =

Rs.

52.20

**Rate for 1 cu.m. (M20) concrete =**

Rs.

**6863.51**

Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

## Analysis of Rate for Ready mix Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

Supplying Ready mixed concrete of M 25 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation.

5560

#### i) Without approved concrete pump.

It. No. 18(i) page-32 of PWD (B)-2017, with 3 rd corrigendum & Addendum dt. 04.06.2018 , rate analysis.

considering cement content = 450 kg/cu.m

Quantity of Cement = 0.45 MT.

issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.45 \times 1.428 \times 6460.00 = \text{Rs.}$

-4151.20

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.45 \times 5873 = \text{Rs.}$

4151.39

### [B] Cost of stone aggregates including carriage

#### 20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $\text{Rs. } 1855.03 \times 0.54 =$

Rs. 1001.72

#### 10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $\text{Rs. } 1703.90 \times 0.36 =$

Rs. 613.404

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size =  $0.90 \text{ cu.m.} \times \text{Rs. } 58.00 =$

Rs. 52.20

Rate for 1 cu.m. (M25) concrete =

Rs. 7227.51

1124

## Analysis of Rate for Ready mix Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

Supplying ready mixed concrete of M 25 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu m of wet concrete produced in computerised batching plant under controlled condition using approved super plasticizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation.

5752

#### i) With approved concrete pump.

It. No. 19(i) page-33 of PWD (B)-2017, with 3 rd corrigendum & Addendum dt. 04.06.2018 , rate analysis.

considering cement content = 450 kg/cu.m

Quantity of Cement = 0.45 MT.

issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

-4151.20

Deduction for cost of departmental cement =  $0.45 \times 1.428 \times 6460.00 = \text{Rs.}$

4151.39

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.45 \times 5873 = \text{Rs.}$

### [B] Cost of stone aggregates including carriage

20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Rs. 1001.72

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $\text{Rs. } 1855.03 \times 0.54 =$

10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Rs. 613.404

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $\text{Rs. } 1703.90 \times 0.36 =$

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

Rs. 52.20

(a) Stone aggregate below 40 mm. nominal size =  $0.90 \text{ cu.m.} \times \text{Rs. } 58.00 =$

**Rate for 1 cu.m. (M25) concrete = Rs. 7419.51**



## Analysis of Rate for Ready mix Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

Supplying ready mixed concrete of M 30 Grade with well graded stone chips of 20 mm nominal size containing designed quantity of cement per Cu.m of wet concrete produced in computerised batching plant under controlled condition using approved super plastisizer, designing concrete mix following I.S. 10262 and I.S. 456, transporting the mix with agitation in transit mixer to work site depositing the mix on a platform erected for the purpose at required levels of concreting and then placing the mix in its final location of form work, compacting and curing the same complete as per specification & direction of the Engineer-in-charge including computerised batching plant transit mixer with all accessories vibrators etc. inclusive of all other incidental charges in this connection complete but excluding cost of hire charge of platform and its supporting staging which would be paid through separate item. [cement to be supplied by the Manufacturer/ supplier] In ground floor and foundation.

5908

#### **i) With approved concrete pump.**

**It. No. 19(i) page-33 of PWD (B)-2017, with 3 rd corrigendum & Addendum dt. 04.06.2018 , rate analysis.**

considering cement content = 450 kg/cu.m

Quantity of Cement = 0.45 MT.

issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.45 \times 1.428 \times 6460.00 =$  Rs.

-4151.20

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.45 \times 5873 =$  Rs.

4151.39

### [B] Cost of stone aggregates including carriage

#### 20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.03 [Stone analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs.  $1855.03 \times 0.54 =$

Rs. 1001.72

#### 10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone analysis]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs.  $1703.90 \times 0.36 =$

Rs. 613.404

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size =  $0.90 \text{ cu.m.} \times \text{Rs. } 58.00 =$

Rs. 52.20

**Rate for 1 cu.m. (M30) concrete =**

Rs. 7575.51



## Analysis of Rate for Ordinary Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

**[A] Rate of Item as per relevant section of Schedule**

Rate

**[Pg.-24, It.-4(i) of P.W.D. (Bldg.) of Schedule of Rates] with 3rd corrigendum.** Ordinary

Cement concrete (mix 1:2:4) with graded stone chips (20 mm nominal size) excluding shuttering and reinforcement, if any, in ground floor as per relevant IS codes.

Rs. 3855.00

(i) Pakur Variety =

Quantity of Cement = 0.22 cum =  $(0.22/0.7)$  MT = 0.3143 MT

Issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460/MT

Deduction for cost of departmental cement =  $0.3143 \times 1.428 \times 6460.00 =$

Rs. -2899.38

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 1.428 \times 0.3143 \times 5873 =$

Rs. 2899.51

**[B] Cost of stone aggregates including carriage**

**20mm. Nominal size (From Salimar) -**

Cost of 1 cu.m. of stone aggregates = Rs. 1855.20 [Stone Analysis]

Rs. 1224.43

Cost of 0.66 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $Rs. 1855.20 \times 0.66 =$

**10mm. Nominal size (From Salimar) -**

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [Stone Analysis]

Rs. 374.858

Cost of 0.22 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] =  $Rs. 1703.90 \times 0.22 =$

**[D] Cost of Loading, unloading of stone aggregates**

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

Rs. 52.20

(a) Stone aggregate below 40 mm. nominal size =  $0.90 \text{ cu.m.} \times Rs. 58.00 =$

Rate per 1 cu.m. (1:2:4) concrete =

Rs. 5506.62



*[Signature]*  
Executive Engineer  
WB-I/GAP/W&B Sector,  
K.M.D.A.

## Analysis of Rate for Ordinary Cement concrete AS PER PWD SCHEDULE OF RATES BASED ON 01-11-2017

### [A] Rate of Item as per relevant section of Schedule

Rate

#### [Pg.-26, It.-10(i) of P.W.D. (Bldg.) of Schedule of Rates] with 3rd corrigendum.

Ordinary Cement concrete (mix 1:1.5:3) with graded stone chips (20 mmbnominal size) excluding shuttering and reinforcement if any, in ground floorbas per relevant IS codes.

(i) Pakur Variety =

Rs. 4451.00

Quantity of Cement = 0.286 cum.

Issue rate of cement vide Item No. 1, Column - 4, Table - 1 - 1 of Annexure - I) = Rs. 6460

Deduction for cost of departmental cement =  $0.286 \times 1.428 \times 6460.00 =$  Rs.

-2638.32

Add Cement cost Supplied Contractor including 10% profit. =  $1.1 \times 0.286 \times 1.428 \times 5873 =$  Rs.

2638.44

### [B] Cost of stone aggregates including carriage

20mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1855.20 [Stone Analysis]

Cost of 0.54 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs. 1855.20 x 0.573 =

Rs. 1063.03

10mm. Nominal size (From Salimar) -

Cost of 1 cu.m. of stone aggregates = Rs. 1703.90 [[Stone Analysis]]

Cost of 0.36 cu.m. of stone aggregates [Ref - Sl. No.-2 /Pg.-B60] = Rs. 1703.90 x 0.287 =

Rs. 489.0193

### [D] Cost of Loading, unloading of stone aggregates

Loading into truck at the lifting point ..... Two points. [vide - Table: T3Pg.-311 of 316]

(a) Stone aggregate below 40 mm. nominal size = 0.86 cu.m. x Rs. 58.00 =

Rs. 49.88

**Rate for 1 cu.m. (1:1.5:3) concrete =**

Rs. 6053.05



  
 Executive Engineer  
 WB-I/GAP/W&B Secty  
 K.M.D.A.

1128

## 30 km from the Work site

ITEM	QUANTITY	RATE	Amount	Sor Reference
Earth work in filling in compound, tank, low land, ditches etc with good earth, in layers not exceeding 150 mm including breaking clods and consolidating the same by ramming and dressing complete. (Payment will be made on profile measurement before and after the work)				building schedule 2017 pg 3 item 5 (iii)
(iii) With carried earth arranged by the contractor within a radius exceeding 5 km but not exceeding 10 km including cost of carried earth	1	512.36	512.36	
carriage cost	1	124	124	building schedule 2017 pg 310 Table r-2
5 km	5	10.9	54.5	
5-10 km	10	10.1	101	
10-20 km				Road SOR -2018 pg-240 item-3.17 (b)
Compacting original ground supporting embankment Loosening, Leveling and Compacting original ground supporting embankment to facilitate of first layer of embankment, scarified to a depth of 150 mm, mixed with water at OMC and then compacted by rolling so as to achieve minimum dry density as given in Tables 300.1 and 300.2 for embankment construction as per Clause 305.3.4 of Specifications for Road & Bridge Works of MoRT&H (5th Revision)	1	24.1	24.1	
Total			815.96	



# WBSIEDCL CHARGE

AND

JACK push





... (read) ... included ... and the same will have to be ...

... regarding the ... consumed ... as well as consumption of light & ...

... The metering arrangement will be at H.F. side of the metering switch gear with ...  
... WBSEDCL. A room with inside measuring ... and a rolling shutter ...  
... SMU (width) x ... SMU (height) to be provided by you to accommodate the same. The point of ...  
... Board's H.F. line will terminate at DP structure with jump operated isolator fuse unit followed by ...  
... supply voltage will be 11KV 3 Phase 50 c/s.

... power supply will be available only after augmentation of WBSEDCL's system.  
... to arrange your own transformer and other equipments to suit your requirement. Power ...  
... devices shall have to be installed by you to keep the power above 0.85 before effecting the ...  
... power supply.

... If there be any outstanding dues and legal complicity against the existing or disconnected service ...  
... under T & MV category should be cleared before effecting the desired bulk connection.

... As the supply system is overhead, there are possibilities of interruption of power ...  
... after completion of work you will have to obtain an approval for energisation of your installation from the ...  
... of the Chief Electrical Inspector, Directorate of Electricity, Govt of West Bengal, 1 Harish Mukherjee ...  
... Kolkata - 700 010.

... For this proposed bulk connection no materials will be supplied by the intending bulk consumer for DCI ...  
... as it is considered non turnkey job.

... You are requested to convey your acceptance of the terms and conditions before depositing the service ...  
... connection charge. However, in the event of deposition of service connection charge without the consent letter ...  
... it will be assumed that you have accepted the above terms & conditions and as it is a non-turnkey basis ...  
... for execution of DCI's part all the materials will be supplied by WBSEDCL.

... This quotation is provisional. Any additional expenditure if arises for effecting the connection and the ...  
... cost of DCI will be computed after finalization of GST will have to be paid by you on demand.

... You are now requested to accept the Terms and Conditions of supply unequivocally and submit the ...  
... document for your new connection.

... Blank agreement format 2 nos

Yours faithfully,

*(Signature)*  
(R.S. Banerjee)  
Sr. & Regional Manager  
North 24-Parganas Regional Office



*Passed for payment*  
*of RO. 8,02,202/-*

*16/3/20*  
*16/3/20*  
*AE (EIA)*  
*16/03/2020*

Sl. No	Name of Work	Diameter of Casing pipe (mm)	Diameter of Carrier pipe (mm)	Length of Casing Pipe (m)	Length of Carrier Pipe (m)	Quoted Value (Rs)	Cost of Driving Pits (Rs)	Cost of Receiving Pit and Valve Chamber (Rs)	Cost of Pipe, Valve & other materials including laying of Carrier Pipe (Rs)	Total Cost of Jack pushing excluding Materials (Rs)	Jack Pushing Rate Driving Rate (Lakh Rs/M)	Remarks
10	Jack pushing under B.T Road ( Tender No SE(EB)/T-26 of 14-15 )	900	600	95	95	17,314,355.00	1,479,460.00	1,344,195.00	4,200,000.00	5,290,000.00	0.95	Approved in 202nd WGT. KMWSA
11	Jack pushing under B.T Road ( Tender No SE(EB)/T-27 of 14-15 )	800	250	45	85	9,848,655.00	1,479,460.00	1,344,195.00	3,200,000.00	3,825,000.00	0.85	Approved in 202nd WGT. KMWSA
12	Jack pushing under B.T Road ( Tender No SE(EB)/T-31 of 14-15 )	800	250	45	85	9,848,655.00	1,479,460.00	1,344,195.00	3,200,000.00	3,825,000.00	0.85	Approved in 202nd WGT. KMWSA
13	Jack pushing under B.T Road ( Tender No SE(EB)/T-30 of 2014-15 )	1400	500 & 300	45	85 & 85	17,885,655.00	1,479,460.00	1,344,195.00	8,987,000.00	6,075,000.00	1.35	Approved in 202nd WGT. KMWSA
14	Jack pushing under B.T Road ( Tender No : SE(EB)/T-28 ( R ) of 2014-15 )	1400	900	45	85	20,415,255.00	1,479,460.00	1,344,195.00	11,516,600.00	6,075,000.00	1.35	Approved in 202nd WGT. KMWSA
15	Jack pushing under B.T Road ( Tender No : SE(EB)/T-35 of 14-15 )	800	250	45	85	9,848,655.00	1,479,460.00	1,344,195.00	3,200,000.00	3,825,000.00	0.85	Placed in 205th WGT KMWSA for approval
16	Jack pushing under B.T Road ( Tender No : SE(EB)/T-35 of 14-15 )	800	500	90	130	19,571,305.00	1,479,460.00	1,344,195.00	9,097,650.00	7,650,000.00	0.85	Placed in 205th WGT KMWSA for approval

Rates of Driving Pit, Receiving Pit, Driving Rate and Supply, Fabrication and Laying rates of Carrier and Casing pipes are taken from existing approved rate of KMDA works.

Signature of S.E ( EB )

Signature of C.E, Dev-I



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**KMDA** KOLKATA METROPOLITAN  
DEVELOPMENT AUTHORITY

Superintending Engineer  
EAST CIRCLE  
WS SECTOR, K.M.D.A.

Tender Documents  
For

J.E

Supplying and Laying of 900 mm dia (ID) M.S. Conduit Pipe 84.2 m in length to be prepared from 14 mm thick M.S. plate by pipe Jacking technique, including supplying and laying of 600 mm dia(ID) M.S. water main as carrier pipe within the conduit 84.2 m in length to be prepared from 12 mm thick MS Plate across and underneath the Railway Track in between mast no-12/30,12/31 and mast no-12/32, 12/33 near Bridge no-S/27, in between Garia Station and Narendrapur station of Eastern Railway as per permission obtained from Railway Authority in connection with the Surface Water Supply Scheme for Rajpur Sonarpur Municipality under AMRUT (2nd Call)

Project Code : 08/WS/KMA/23-1

NIT No : 25/SE(EC)/WS/KMDA of 2018-2019  
Dated : 4/12/2018

Serial - 1  
(Part - A)

Tender No : 46/SE(EC)/WS/KMDA of 2019-2020

OFFICE OF THE SUPERINTENDING ENGINEER  
EAST CIRCLE, WS SECTOR, KMDA.  
'C'-BLOCK, 2ND FL. UNNAYAN BHAVAN  
SALT LAKE CITY, KOLKATA-700091.

H. ENTER

*[Handwritten Signature]*

Propriet



Price Schedule for the Work : "Supplying and Laying of 900 mm dia (ID) M.S. Conduit Pipe 84.2 m in length to be prepared from 14 mm thick M.S. plate by pipe Jacking technique, including supplying and laying of 600 mm dia (ID) M.S. water main as carrier pipe within the conduit 84.2 m in length to be prepared from 12 mm thick MS Plate across and underneath the Railway Track in between mast no-12/30,12/31 and mast no-12/32, 12/33 near Bridge no-S/27, in between Garia Station and Narendrapur station of Eastern Railway as per permission obtained from Railway Authority in connection with the Surface Water Supply Scheme for Rajpur Sonarpur Municipality under AMRUT (2<sup>nd</sup> Call)"

e-TENDERING NIT NO : 25/SE(EC)/WS/KMDA of 2018-2019 Dated 04/12/2018 Sl. -1

Sl No	Description of Item	Quantity	Unit	Rate	Amount
1	Preparation of drawing and design for driving pit and reception pit for jack push under railway track at desired depth and other necessary paper correspondence as per requirement of the concerned Railway authority and getting the approval of the same by the competent Authority for the proposed jack push work	1	Each	100000	100000.00
2	Construction of a "Drive Pit" and "Reception Pit" including thrust wall at desired depth for each and one valve chamber for Jack Pushing as per approved drawing of the concerned Authority, including excavation of earthwork and filling, reinforcement, concreting (M-25), Ply-board/Steel shuttering, 15 mm. plastering neat cement, providing manholes with cover (35 MT Capacity) on top slab and inside ladder by M.S. etc. as per specification and direction of the Engineer-in-charge and all complete in all respect.	2	Each	300000	600000.00
3	Derusting , brushing, cleaning at the <b>outer</b> surface of M.S. Pipes and specials, applying one coat of primer, two wraps of 2 mm thick Coal Tar based Tape(with primer between the wraps as per coating manufacturer's requirement) like Corporate / Universal Surface Protection or any other equivalent brand of Coal Tar based Tape as per specification given in Clause - 5 under Execution including necessary tests with Holiday detector at no extra cost and as per direction of the E.I.C.	410.46	Sqm	688	282396.48



H. ENTERPRISE

*[Handwritten Signature]*

Propriet

*[Handwritten Signature]*

Superintending Engg  
EAST CIRCL

Signature of  
Tenderer

Signature of Tender  
Inviting Authority

Signature of Tender  
Accepting Authority

Sl No	Description of Item	Quantity	Unit	Rate	Amount
4	Derusting, brushing & cleaning the inside surface of the manufactured /M.S. pipes and specials applying one coat of approved primer over it and providing 3coats of anticorrosive and non-toxic paint (two coat in the factory over primer and the third coat at site after laying) to all pipes & specials inside surface as per I.S. specification & direction of the Engineer-in-Charge. Thickness of one coat of paint to be such as to maintain the surface coverage of 12 M <sup>2</sup> to 13 M <sup>2</sup> per litres of paints. A length of 150 mm at each end of pipes and specials will be provided with a coat of primer and three coats of painting after jointing at site.	396.708	Sqm	73	28959.68
5	Supplying 14 mm. thick M.S. Pipe by "SAIL MAKE/TATA MAKE" at site and laying the same at site by 900 mm. internal dia. M.S. pipe conduit as a casing and providing the same underneath of Railway Track by Jack Pushing Technique as desire depth as per direction of the Engineer - in- charge and complete in all respect. [Cost to include of all required items to execute the said works as per drawing specification and direction of the Engineer-in Charge including all materials , labours, Fabrication Cost, hire charges for tools and plants all Complete.]	84.2	M	48481.28	4082123.56
6	Fabrication of M.S. specials. Viz. reducer, enlarger, tees, bends, puddles, bell mouth out of 10 mm thick M.S. barrel/MS spiral welded pipe including cutting of the barrel/spiral welded pipe to exact size & shape as per direction of engineer in charge	1	M	53097.14	53097.14
7	Supplying fitting and fixing in position reinforced polymer concrete manhole cover with frame. i) 35 MT load bearing capacity round manhole cover providing with matching frame of size, cover: (700X100) mm frame:- (900X185) mm, wight ; - 250 Kg (approx)	2	Nos	8400	16800.00



H. ENTERPRISE

*[Signature]*  
Propriet

Signature of  
Tenderer

Signature of Tender  
Inviting Authority

*[Signature]*  
Superintending Engineer  
EAST CIRCLE  
K.M.D.A.  
Signature of Tender  
Accepting Authority

SI No	Description of Item	Quantity	Unit	Rate	Amount
8	Providing and placing fine sand to outer annular space between 900 mm. and 600 mm. dia M.S. pipe and the conduit M.S. pipe and Filling of steel pipes and specials with water by the contractor and testing hydraulically the same under a head of pressure as per specification including supply of water and necessary equipments such as blank flanged, pumps, gauges etc. required for the testing including providing suitable end thrust block and dismantling and removal of the same after completion of the testing, fixing special type of ends caps, blank flanges and removal of the same after completion of welding, jointing gas cutting etc. as necessary including of jointing materials, disposal of water after testing etc. all complete as per specification and direction of the Engineer-in-Charge after testing etc. all complete as per specification and direction of the Engineer-in-charge.	84.2	M	424.38	35732.46
9	Supplying and laying 600 mm dia. (internal) M.S. Pipe including lowering, inserting and jointing the same M.S. conduit as per the level and slope as shown in the drawing and as per the direction of the Engineer-in -Charge and complete in all respect. (M.S. Pipe to be prepared from 12 mm thick plate and the rate includes protective measures to be applied over the pipe)	100	M	15994.12	1599411.96
10	Supplying, Lowering, fitting and fixing of all types of valves in proper position and alignment using chain pully block or crane (for diameter above 250 mm) by providing temporary support, as required, gaskets nuts & bolts etc. all complete as per specification and direction of the Engineer-in-Charge. <b>(a) 600 mm dia Sluice Valve</b>	1	Each	161588	161588.00
11	Supply, fitting & fixing 100 mm dia CI Air valve.	1	Each	11372.00	11372.00
12	Supply, fitting & fixing of standard Puddle flange at the location as per the direction of Engineer-in-charge	4	Each	33841.90	135367.61
13	Supplying and fabricating 20mm to 32 mm thick (finished thickness )M.S flange ,properly ribbed .One face machined including drilling drilling hole as per standard table ,fitting and fixing the same with M.S pipe by electric arc welding as per relevant I.S Specification using standard electrodes as per direction of the Engineer-in-charge .(a) 600 mm dia				

H. ENTERPRISE



Propriet

Signature of  
TendererSignature of Tender  
Inviting Authority

Superintending  
EAST CIRCSignature of Tender  
Accepting Authority

CENTOR. K.

Sl No	Description of Item	Quantity	Unit	Rate	Amount
		2	Each	13094.00	26188.00
14	Supplying, fitting and fixing of M.S. Machine end fabricated with 30 mm to 40 mm thick M.S. Plate properly Machining and joint with the socket end of C.I. / D.I. Pipe with supply of S.B.R. Gasket and welding with M.S. Pipe in the other end as per direction of Engineer - in - charge. a) <b>600 mm dia</b>	1	Each	27150.00	27150.00
15	Supplying, fitting and fixing of M.S. Machine end fabricated with 30 mm to 40 mm thick M.S. Plate properly Machining and jointing with the Spigot end of C.I. / D.I. Pipe with supply of S.B.R. Gasket and welding joint with M.S. Pipe in the other end as per direction of Engineer - in - charge.	1	Each	33900.00	33900.00
16	Gas cutting of M.S. pipes and/or M.S. plates of different thickness all complete as per specification and direction of the Engineer-in-Charge. i) <b>12 mm thick plate.</b>	100	M	275	27500.00
17	Field welding of M.S. plates by means of electric arc welding as per relevant I.S. specification using standard electrodes including edge preparation and charges of deployment of electric generator set with fuel, lubricant and all other tools and plants all complete as per specification and direction of the Engineer-in-Charge. i) Throat thickness 12 mm	140	M	1352	189280.00
18	Supplying and delivering at site of jhama metal/ brick bats and labour for spreading and consolidation the same with power roller layer as per standard specification and direction of the Engineer-in-Charge complete in all respect.				
	a) Brick bats (size 90 mm. to 63 mm.) 150 mm compacted thickness	130	Sqm	139	18070.00
	b) Jhama metal (size 63 mm. to 45 mm.) 150 mm compacted thickness	130	Sqm	238	30940.00

Total Rs. 7459876.89

Add @ 12% GST 895185.23

Add @ 1% Educational cess 74598.77

Total Rs. 8429660.88

Say: 8429661.00

H. ENTERPRISE  
  
 Proprietor

Signature of TENDERER



Signature of TENDER INVITING AUTHORITY

  
 Superintending Engineer  
 - EST CIRCLE  
 Signature of TENDER ACCEPTING AUTHORITY  
 K.M.D.A.

Ref: QTN/AP/AS/BK/2018-19/0746

29<sup>th</sup> AUGUST '2018

**TO,  
ENVIRONMENTAL ENGINEERING SERVICES  
INFINITY THINK TANK, TOWER-II,  
GROUND FLOOR, UNIT- 102,  
SECTOR- V, SALLAKE CITY,  
KOLKATA – 700 091.**

**Kind Attn: Mr. Abhijit Paul – Environmental Engineer.**

**SUB: Offer for Ashok Leyland make LEYPOWER brand 100KVA,  
125KVA, 160KVA 3Phase Silent D.G. Set with Manual Control Panel.**

Dear Sir,

With reference to the discussion, regarding your requirement of 100KVA,125KVA, 160KVA 3Phase Silent Diesel Generator Set with Manual Control Panel for above Site and take pleasure to submit our detailed techno-commercial offer for the same in separate annexed sheets.

Please note that we have offered you **ASHOK LEYLAND** make "**LEYPOWER**" brand Silent DG Set, **which is most fuel efficient, aesthetically designed, meeting latest CPCB- II norms and are powered by the compact, trouble free performance Ashok Leyland series Diesel Engines ensuring minimum maintenance and low operating costs. Our country-wide service dealer network ensures prompt service and spare parts support throughout India.**

**Advantage of Ashok Leyland make LEYPOWER brand D.G. Set.**

- Robust, Compact, Fuel efficient Diesel Generator sets designed to operate under arduous site conditions
- Latest Technology & Highly Reliable
- Highly Engineered for Optimized Power Solution
- **Designed to operate continually 24 x 7 @ 100% load output.**
- Better Fuel Consumption



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- Low Running cost
- Compact Foot Print
- Easy access for maintenance
- **600 hours/12 Months lube oil changed period.**
- **Sales & Service available under the same roof.**
- **24 months or 5000 operational hours (Overall D.G. Set),** whichever is earlier against any manufacturing defect provided manufacturers recommended lube oil, coolant and genuine spare parts are used.

We hope you will find our offer most competitive and look forward to receiving your valued order at an early date.

Thanking you,

Yours faithfully,  
For **AMAZE POWER**

**ALOKESH SARKAR**  
**CLUSTER HEAD**  
**POWER SOLUTION BUSINESS**  
**MOBILE:9674972022.**



**TECHNICAL SPECIFICATION**

**100KVA/125KVA SILENT D.G.SET 415 VOLT, 3PH, 50 HZ, 0.8PF AT 1500RPM POWERED BY ASHOK LEYLAND ENGINE COUPLED WITH LEYPOWER MAKE BRUSHLESS ALTERNATOR FITTED ON COMMON MS BASE COMPLETE WITH FUEL TANK, BATTERY 12 VOLT,150 AMPS/HR, RESIDENTIAL SILENCER AND STANDARD MANUAL CONTROL PANEL.**

	<b>100KVA</b>	<b>125KVA</b>
<b>Engine Rating</b>	Ashok Leyland	Ashok Leyland
Make	AL6DT1DG1	AL6DT1DG2
Model	126.05	155.5
B.H.P.	4	4
Stroke	6	6
No. of Cylinders	1500	1500
RPM	Inline	Inline
Cyl. Configuration	Clockwise viewed from flywheel end	Clockwise viewed from flywheel end
Direction of Rotation	Turbocharged after cooled	Turbocharged after cooled
Method of aspiration	Coolant cooled	Coolant cooled
Method of cooling	<b>Electronic</b>	<b>Electronic</b>
<b>Type of Governor</b>	12V Electric Start	12V Electric Start
Starting system	10% for 1hr. for every 12hrs. running	10% for 1hr. for every 12hrs. running
Overload capacity	<b>Continuous</b>	<b>Continuous</b>
Duty	Low lube oil pressure	Low lube oil pressure
Safety control	High coolant temp.	High coolant temp.
	Over speed	Over speed
Applicable Standards	ISO 3046,BS 5514	ISO 3046,BS 5514
<b>Lube oil changed Period</b>	<b>600 hours./12 Months</b>	<b>600 hours./12 Months</b>

**ALTERNATOR**

<b>Make</b>	: <b>LEYPower</b>
Rating	: 100KVA/125KVA
KW	: 80KW/100KW
Type	: Brushless
Excitation	: Self excited, self regulated (AVR)
Enclosure	: SPDP
Enclosure protection	: IP-23
Rated Voltage	: 415V
No. of Phases	: 3
Frequency	: 50Hz
Power Factor	: 0.8 (lag)
Rated current	: 139.12Amps./173.91Amps
Class of Insulation	: H
Voltage Regulation	: ±1%
Overload capacity	: 10% for 1hr. for every 12hrs. running.
Applicable standards	: IS 4722/BS 5000



# Quotation



**TECHNICAL SPECIFICATION**

**160KVA/128KW SILENT D.G.SET 415 VOLT, 3PH, 50 HZ, 0.8PF AT 1500RPM POWERED BY ASHOK LEYLAND ENGINE COUPLED WITH LEYPOWER MAKE BRUSHLESS ALTERNATOR FITTED ON COMMON MS BASE COMPLETE WITH FUEL TANK, BATTERY 12 VOLT, RESIDENTIAL SILENCER AND STANDARD CONTROL PANEL.**

<b>Engine Rating</b>	<b>160KVA</b>
Make	Ashok Leyland
Model	AL6DTIDG4
B.H.P.	197.05
Stroke	4
No. of Cylinders	6
RPM	1500
Cyl. Configuration	Inline
Direction of Rotation	Anti-Clockwise viewed from flywheel end
Method of aspiration	Turbocharged after cooled
Method of cooling	Coolant cooled
<b>Type of Governor</b>	<b>Electronic</b>
Starting system	12V Electric Start
Overload capacity	10% for 1hr. for every 12hrs. running
<b>Duty</b>	<b>Continuous</b>
Safety control	Low lube oil pressure High coolant temp.
Applicable Standards	ISO 3046, BS 5514

**ALTERNATOR**

<b>Make</b>	<b>: LEYPOWER</b>
Rating	: 160KVA
KW	: 128KW
Type	: Brushless
Excitation	: Self excited, self regulated (AVR)
Enclosure	: SPDP
Enclosure protection	: IP-23
Rated Voltage	: 415V
No. of Phases	: 3
Frequency	: 50Hz
Power Factor	: 0.8 (lag)
<b>Rating</b>	<b>: Continuous</b>
Rated current	: 222.6Amps.
Class of Insulation	: H
Voltage Regulation	: ±1%
Overload capacity	: 10% for 1hr. for every 12hrs. running.
Applicable standards	: IS 4722/BS 5000



### **MANUAL STANDARD CONTROL PANEL**

Control panel shall be made of CRCA Sheet, floor mounted, indoor type, dust and vermin proof and powder coated and suitable for 415V, 3Phase, 50Hz system. The panel shall consist of the following features:

- Aluminium Bus Bar of suitable capacity.
- Digital type Multi function Meter for measuring Volts/Amps/Frequency /Power Factor.
- Monitor with display of engine safety features.
- Current Transformers of suitable ratio.
- MCB/HRC Fuses for control protection.
- Indicating Lamps for DG ON/Load ON.
- Moulded Case Circuit Breaker of suitable rating with short circuit and overload protection.
- Earth Studs
- Engine Start/Stop Key.

### **ACOUSTIC ENCLOSURE**

Acoustic enclosure shall be made of specially procured CRCA Sheet and structural sheet metal Base frame and comply with CPCB norms with following features:

- The most compact, six sided close, modular construction and detachable.
- Meet CPCB / MOEF norms.
- Sound level < 75 dBA at one meter distance.
- Easy accessibility around the DG Set, which ensures optimum serviceability.
- Special power coated enclosure, weather proof, corrosion resistant , environment friendly..
- Specially designed lifting hooks .
- Use of high quality hardware ensures longer life of enclosure.
- Provision for emergency stop facility.
- Fuel tank is specially designed and mounted inside of the enclosure as a integral part of Acoustic enclosure.

### **DIMENSIONS : (Without Silencer):**

- 1) For 100KVA/125KVA DG Set:
- 2) For 160KVA DG Set:

L: 3300, W: 1250, H: 1565mm  
L: 3900, W: 1350, H: 1700mm



**PRICE SCHEDULE :**

1)	Price for <b>100KVA</b> , Silent D.G. Set with Manual Control Panel( <b>CPCB – II Engine</b> )	:	Rs. 6,73,875/- Per Set
	Add GST @18%	:	Rs. 1,21,298/-
	<b>Total</b>	:	<b>Rs. 7,95,173/-</b>
	<b>Special Discounted Price including GST.</b>	:	<b>Rs. 7,15,000/-</b>
2)	Price for <b>125KVA</b> , Silent D.G. Set with Manual Control Panel( <b>CPCB – II Engine</b> ).	:	Rs. 7,20,000/- Per Set
	Add GST @18%	:	Rs. 1,29,600/-
	<b>Total</b>	:	<b>Rs. 8,49,600/-</b>
	<b>Special Discounted Price including GST.</b>	:	<b>Rs. 7,65,000/-</b>
3)	Price for <b>160KVA</b> , Silent D.G. Set with Manual Control Panel( <b>CPCB – II Engine</b> ).	:	Rs. 9,09,000/- Per Set
	Add GST @18%	:	Rs. 1,63,620/-
	<b>Total</b>	:	<b>Rs. 10,72,620/-</b>
	<b>Special Discounted Price including GST.</b>	:	<b>Rs. 9,65,000/-</b>
4)	<b>Transportation Charges.</b>	:	<b>Ex- Sankrail, Howrah basis.</b>

**COMMERCIAL TERMS & CONDITIONS**

Payment	:	25% advance along with the order. Balance 75% against proforma invoice prior to dispatch.
Delivery	:	<b>Ready stock subject to prior sale.</b> Alternatively, within 2-3 weeks from the date of receipt of confirmed order along with advances.
Warranty	:	24 months or 5000 operational hours, whichever is earlier against any manufacturing defect provided manufacturers recommended lube oil, coolant and genuine spare parts are used.
Statutory changes	:	Taxes ruling at the time of dispatch will be applicable.
Validity	:	30 days from the date of this offer.
Disputes	:	All disputes are subject to Kolkata High Court Jurisdiction.



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<b>Mains Powered Electromagnetic Flowmeter</b>					
Optiflux 2000 / Hard Rubber liner / SS304 Flow tube / SS316 Electrodes / DIN PN 10 CS Flange / SS 304 Coil housing / SS316 GND Rings / IP 68 with 50 mtrs cable					
IFC 100/ Basic I.O / 230 V AC Power supply / 4-20mA/ Accuracy $\pm 0.5\%$ of Measured flow / Die-cast Aluminum housing / M20 x 1.5 Polyamide Cable Glands					
Sr. No	Instrument	Meter Size	Qty	Unit Price	Total Price
1	Mains Powered Electromagnetic Flowmeter	500	1	320500	320500
2	Mains Powered Electromagnetic Flowmeter	450 (BS 4504)	1	297500	297500

Item:

Level Transmitter Radar type for 0 to 20M with display and retransmission output

Rs.75000

Qty:2nos.

<b>Prices:</b> Ex Works Pune (as above)
<b>Freight &amp; Insurance:</b> In Client's Scope
<b>Delivery:</b> Mains Powered Flowmeter 12 - 16 Weeks After Receipt of Advance, Drawing Approval & Mfg Clearance
<b>Payment Terms:</b> 30% advance balance against PI before despatch
<b>GST:</b> 18% Extra to the Client's account. TCS 0.1% Extra to Client's account.
<b>Inspection:</b> Rs. 15000/- Extra If applicable, (10% of the total ordered Qty will be offered for inspection as per approved QAP)
<b>TPI Charges:</b> Third-Party Inspection charges in Client's Scope.
<b>Warranty:</b> 12 months from supply or 18 months from commissioning whichever is earlier.
<b>Delay Charges:</b> Any delay of more than 2 weeks to conduct an inspection or lift material after inspection will be charged at 2% per week.



Ref: E+H/MFM/TBSL/11082021  
Date: 11/08/2021

Endress+Hauser   
People for Process Automation

To  
Environmental Engineering Services  
Infinity Think Tank, Tower II,  
GP Block, Saltlake City, Sector V, Kol-91  
Kind Attn: Mr. Sujan Khan (Mob- 6295316032)  
Sub: Offer for Full Bore Magnetic Flowmeter-A/c: KMDA Santragachi  
Dear Sir,

We thank you for the enquiry & are pleased to submit our offer for the required instruments as below:

Sr No	E+H Model No	Unit Basic Price (INR)	Qty	Total Basic Price (INR)	HSN Code	REMARKS
1	10L4F-U20A1AN4A4AA	245000	1	245000	90261010	Size: DN450 (Magflowmeter)
2	10L5H-U20A1AN4A4AA	255000	1	255000	90261010	Size: DN500 (Magflowmeter)

Encl: Technical Specifications

Commercial T&C:  
Price Basis: Ex- Works, Bhiwandi  
P&F: Extra @ 2%  
Insurance: Extra @ 1.5%  
Freight: Extra @ 2%  
GST: Extra @ 18% on basic  
Terms of Payment: 30% advance & balance against PI before despatch  
Warranty: 12 months from date of invoice  
Delivery: Materials will be made ready within 8 weeks from the date of PO.  
PO to be placed on:  
Endress+Hauser (I) Pvt Ltd, Mumbai  
Trust you will find the offer inline to your requirement.  
Please do revert for any sort of clarification.

Regards,

Souvik Mukherjee  
Sr. Manager-Sales  
For Endress+Hauser (I) Pvt Ltd  
Mob: 9748018093  
Email: souvik.mukherjee@endress.com

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Date: 14.06.2020

Dear Mr. Debasish Sarkar,

**QUOTATION**

	<p>Hydrostatic Level Transmitter</p> <p>Brand: NIVELCO</p> <p>Power Supply : 10 to 30 V</p> <p>Rs 55,000/Unit</p>
<p><b>SPECIFICATIONS</b></p> <p>12 – 30 V DC - 10 °C ... + 60 °C 0 – 200 m 4 – 20 mA + HART® or 0 – 10 V IP68 ATEX</p>	<p><b>PRODUCT PROPERTIES</b></p> <ul style="list-style-type: none"> <li>• 2- or 3-wire submersible transmitter</li> <li>• Plastic or stainless steel body</li> <li>• Capacitive ceramic, piezoresistive stainless steel and piezoresistive ceramic sensor</li> <li>• Up to 200 m range</li> <li>• Reverse polarity protection</li> <li>• Optional lightning protection</li> <li>• Linearity: <math>\pm 0.25\%</math></li> <li>• HART communication</li> <li>• Venting tube in cable</li> <li>• Incorporated Pt100 temperature sensor</li> <li>• Explosion-proof models</li> </ul>

**APPLICATIONS**

1. Borehole transmitter for the water industry
2. Also for small diameter pipes
3. Clean or contaminated water, sewage
4. Weak acids, caustics

Please Find the Brochure attached with this quotation.

Yours Sincerely,



S N Deshpande  
Director



1148



**J.J.**  
**Electrical Corporation**

22, RABINDRA SARANI  
 ROOM NO. 207  
 KOLKATA - 700 073  
 PHONE : 033-2236 1414  
 033-2337 7811  
 FAX : 033-2334 7810  
 E-mail : jjelectricalcorporation@gmail.com

**QUOTATION**

Ref: JJ/EES/124/20-21

Date: 30.01.2021

Environmental Engineering services  
 Infinity Think Tank, Tower II  
 Block, Saltlake City, Sector V, Kol 91.

Kind Attention : Mr. Sumanta Karmakar  
 Sub : Offer for the supply of LT Panel

Dear Sir,

Please find our offer with Commercial Terms and Conditions as below :-

S.N.	Discription	RATE (IN INR)	QNTY	AMOUNT (IN INR)
1	LT PANEL NO 01 , Dimensions (1850 mm x 1950 mm x 530 mm)	Rs.539,325.00	1.00	Rs.539,325.00
2	LT PANEL NO 02 , Dimensions (1850 mm x 1950 mm x 530 mm)	Rs.567,996.00	1.00	Rs.567,996.00
3	LT PANEL NO 03 , Dimensions (2000 mm x 1750 mm x 400 mm)	Rs.324,000.00	1.00	Rs.567,996.00
4	LT PANEL NO 04 , Dimensions (1850 mm x 1850 mm x 530 mm)	Rs.417,150.00	1.00	Rs.417,150.00
5	LT PANEL NO 05 , Dimensions (1850 mm x 1950 mm x 530 mm)	Rs.539,325.00	1.00	Rs.539,325.00
6	LT PANEL NO 06 , Dimensions (2700 mm x 2000 mm x 600 mm)	Rs.841,320.00	1.00	Rs.841,320.00
			<b>GRAND TOTAL</b>	<b>Rs.3,473,112.00</b>

**COMMERCIAL TERMS & CONDITIONS**

ICES	F.O.R. Destination
ST	18% Extra
LIVERY	Within 9 weeks from the date of receipt of your Technically & Commercially clear purchase Order/L.O.I. and Drawing
ALIDITY	Upto 30 Days
YMENT	50% Payment with PO and balance before Delivery

Thanking you

Yours Faithfully  
 J.J Electrical Corporation



( Authorised Signatory )



ELECTRICALS / LED LIGHTINGS / INSTRUMENTS



1149

Dear Sir/Madam

Please find the quotation as follows

<b>Quotation For Panel- 01</b> <b>Dimensions (1850mmx 1950mmx 530mm)</b>	
Price(Excluding GST)	Rs 3,99,500/-

<b>Quotation For Panel- 02</b> <b>Dimensions (1850mmx 1950mmx 530mm)</b>	
Price(Excluding GST)	Rs 4,20,738/-

<b>Quotation For Panel- 03</b> <b>Dimensions (2000mmx 1750mmx 400mm)</b>	
Price(Excluding GST)	Rs 2,40,000/-

<b>Quotation For Panel- 04</b> <b>Dimensions (1850mmx 1850mmx 530mm)</b>	
Price(Excluding GST)	Rs 3,09,000/-

<b>Quotation For Panel- 05</b> <b>Dimensions (1850mmx 1950mmx 530mm)</b>	
Price(Excluding GST)	Rs 3,99,500/-

<b>Quotation For Panel- 06</b> <b>Dimensions (2700mmx 2000mmx 600mm)</b>	
Price(Excluding GST)	Rs 6,23,200/-

Please note all the above quotations are made on the basis of genuine L&T Products.



1150



# D'Mak ENERGIA PRIVATE LIMITED

 B 123, Electronics Estate , Sector - 25 , GIDC, Gandhinagar - 382024  
 marketing@dmakgroup.com, dmakenergia@gmail.com  
 www.dmakenergia.com , www.dmakindia.com  
 +91 9426828423 , +91 7096015305



CIN - U31900GJ2020PTC113917

Quotation No: DMAK/2020-21/3918/ 1

Date: 30-January-2021

To,  
M/s. ENVIRONMENTAL ENGG. SERVICES  
INDIA

Kind Atten: ENVIRONMENTAL ENGG. SERVICES  
Sub: Offer for DMAK\_2020-21\_3918\_ENVIRONMENTAL ENGG. SERVICES

Dear Sir,

We thank you very much for your interest in D'Mak products. With reference to your inquiry cited above, we are pleased to submit herewith our detailed and most competitive offer for Electrical Project. Our offer consists of the following schedules:

Schedule 1	:	Bill of Material
Schedule 2	:	Offer Price
Schedule 3	:	Battery Limit, Commercial Terms & Conditions

We hope you shall find the above to your entire satisfaction. However, should you need any further clarification, please feel free to call on us.

We assure you that given an opportunity; we will strive hard to maintain your high standards of quality. It will also be our Endeavour to give you the best services / co-operation for a long business association in the mutual interest.

Awaiting your valued patronage and thanking you, we remain,

Truly yours,

For D'Mak Energia Pvt. Ltd.

Dixit Patel

Encl.: As Above.





1151  
**D'Mak ENERGIA PRIVATE LIMITED**

B 123, Electronics Estate, Sector 25, GIDC, Gandhinagar - 382024  
marketing@dmakgroup.com, dmakenergia@gmail.com  
www.dmakenergia.com, www.dmakindia.com  
+91 9426828423, +91 7096015305



CIN U31900GJ2020PTC113917

### Schedule: - 2(Offer Prices)

SR. NO.	PANEL NAME	PANEL QTY.	UNIT PANEL COST (INR)	FINAL PANEL COST (INR)
1	LT PANEL 1	1	1,03,300.00	1,03,300.00
2	LT PANEL 2	1	1,07,300.00	1,07,300.00
3	LT PANEL 3	1	58,000.00	58,000.00
4	LT PANEL 4	1	65,700.00	65,700.00
5	LT PANEL 5	1	1,01,200.00	1,01,200.00
6	LT PANEL 6	1	1,60,500.00	1,60,500.00
	<b>TOTAL NUMBER OF PANELS</b>	<b>6</b>	<b>TOTAL COST (INR)</b>	<b>5,96,000.00</b>

**In Words: Rupees Five Lac Ninety Six Thousand Only**

### Schedule: - 3 (Declarations & Commercial Terms, Conditions)

**PRICE:** Above quoted prices are Ex. Works at Gandhinagar.

**SALES TAX:** Price of Electrical Goods quoted above is **EXCLUSIVE** of Sales Tax. Present rate of GST is **18%**. However, Taxes and Duties prevailing at the time of dispatch will be levied.

**OTHER LEVIES:** Other levies like Octroi, Entry tax, etc. if applicable will be to your account.

**FREIGHT:** Extra at actual.

**TRANSIT INSURANCE:** Transit insurance has to be arranged by you.

**TERMS OF PAYMENT:** 70% against Order, 30% against Performa Invoice. Overdue payments after "Payment Due Date" will attract interest @24% per annum.

**INSPECTION:** The Material will be tested at our end. You may depute your representative at our works to witness of testing.

**VALIDITY:** 7 days from the date of this offer.

*For D'Mak Energia Pvt. Ltd.,*

**Dixit Patel**



1152

**AQUA MACHINERIES PVT. LTD.**

www.aquapumps.com



Energy Efficient & Reliable Dry Motor Submersible Pumps for Water Intake, Transfer, Distribution, Storm Water Disposal, Sewage & Effluent Management, Drainage, Cooling Water Circulation & Fire Fighting Power Stations, Mines, Tunnels, Handling Slurries & Dredging etc.

CIN No. U29120GJ1984PTC006975

GST 24AACGP3914A1ZB

Ref : AMPL/ KOL/ 801/21-22

Date: 12-08-2021

Environmental Engineering Services  
Infinity Think Tank, Tower II,  
GP Block, Salt lake, Sector V,  
Kol-700091

Sub: Budgetary offer for KMDA-Santragachi Sewerage Project

Dear Sir

With reference to the above we are pleased to submit our offer as follows:

**Type of Pump:** Aqua make vertical, single stage, non clog & submersible dry motor (Class F insulation, IP-68 protection) set in mono block design with bottom suction and side discharge and suitable for pumping of all kind Raw Unscreened sewage /Storm Water etc.

**Scope of Supply:** Pump-Motor set with 10 meter cable, Auto Coupling with integral bend, Pump Monitoring Unit with Guide Pipe and Chain 10 meter each.

**Price:** Ex-Works Ahmedabad, Packing & Forwarding, Freight, GST extra as applicable.

Srl.No	Capacity (M3/Hr)	Head (Meter)	Motor Rating	Unit Price, Ex-Works basis
1	31	8	2 H.P	Rs.1,39,500-00 Each
2	61	8	3 H.P	Rs.1,49,990-00 Each
3	136	8	7.5 H.P	Rs.2,24,500-00 Each
4	156	13	10 H.P	Rs.2,59,950-00 Each
5	312	13	17.5 H.P	Rs.3,42,750-00 Each
6	702	13	35 H.P	Rs.5,89,750-00 Each

Thanks &amp; Regards

**For Aqua Machineries Pvt Ltd**

**S.N.Bhaduri,**  
**9998652690**

**Registered Office & Manufacturing Plant**

Survy No.442/2, 504/1 &amp; 2, Near Hari Darshan Estate, Meje : Ramol, Gujarat.

**Customer Support - [All India]**

• **Water Segment :**  
mng@aquapumps.com  
(+91-93246 59526)

• **Power Segment :**  
arm@aquapumps.com  
(+91-93288 53321)

• **Centralized Quotation Cell**  
marketing@aquapumps.com  
(+91-80001 53324)

• **Purchase**  
purchase@aquapumps.com  
(+91-93770 53315)

• **Dispatch**  
dispatch@aquapumps.com  
(+91-78170 82902)

• **Sewage Segment :**  
jgb@aquapumps.com  
(+91-93710 64672)

• **Slurry, Mines & Dredging :**  
mines@aquapumps.com  
(+91-93288 53321)

• **Production Coordinator**  
prj@aquapumps.com  
(+91-78170 82906)

• **Invoice & Accounts**  
invoice@aquapumps.com  
(+91-80001 55323)

• **After Sales & Services**  
service@aquapumps.com  
(+91-90167 53328) (+91-98259 51116)

• up@aquapumps.com  
(+91-70433 01555)

• rdj@aquapumps.com  
(+91-95126 40005)

• guj@aquapumps.com  
(+91-93770 53314)

• kolkata@aquapumps.com  
(+91-99986 52690)

• hyd@aquapumps.com  
(+91-81440 03131) (+91-76220 02239)

• delhi@aquapumps.com  
(+91-78782 55323)

• mc@aquapumps.com  
(+91-98262 08872)

• pune@aquapumps.com  
(+91-93266 70605)

• kar@aquapumps.com  
(+91-96328 43311)

• chennai@aquapumps.com  
(+91-81440 03131)

Feedback : ajp@aquapumps.com

110 07/07/2020



1153

# SHIVA ENTERPRISES

Sales & Service of Pumpsets



34-A, METCALFE STREET, KOLKATA - 700 013 ( Near 15, Ganesh Chandra Avenue)  
Phones: (033)2211-3166, 2211-9223/ 2211-8491 \* E-mail : [info@shivapumps.com](mailto:info@shivapumps.com)  
Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025.  
Phones: (033)2454-8483, 2454-8594 / 2454-2541 \* E-mail : [cc@shivapumps.com](mailto:cc@shivapumps.com)  
Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129  
Date : 21. 07. 2021

To  
The General Manager  
M/s. ENVIRONMENTAL ENGINEERING SERVICES  
Infinity Think Tank, Tower-II,  
Ground Floor, Unit-102, Sector-V,  
Salt Lake City,  
Kolkata- 700091  
Mobile : 9830068733  
E-mail : [ajeet@eesindia.net](mailto:ajeet@eesindia.net), [abhijitpaul@eesindia.net](mailto:abhijitpaul@eesindia.net)

**SITE : K.M.D.A. SANTRAGACHI JHEELK PROJECT FOR PUMP HOUSE NO. 1**

Kind Attn. : Mr. Abhijit Paul ( 9038992098)

Dear Sirs,

Sub : Budgetary Techno-Commercial Offer of "KISHOR" make Non- Clog  
Submersible Sewage Pumpset A/c. K.M.D.A Kestopur Canel for Pump  
House No. 1to14 against your e-mail enquiry dtd.18.07.2019.

We thank you for your above valued enquiry and subsequent visit of Mr. S.N. Mukherjee-  
Marketing Consultant on dtd. 27.07.2019 and you confirmed the details of pump requirement  
on dtd.29.07.2019.

We have pleasure to submit our Technical Offer for "KISHOR" make Submersible Sewage  
Pumpsets with Performance Curve in separate sheet against your above requirement. Kindly  
note that we are Authorized Regional Sales & Service Dealer of "KISHOR" make Pumps.

We trust, you will find our offer quite competitive and in line to your requirement and shall  
favour us with your valued order, which shall receive our best attention.

Kindly furnish the following particulars along with your valued order: 1]

- GSTNO.
- 2] TINNO.
- 3] PAN NO.
- 4] E-mail No.
- 5] Name of Contact Person
- 6] Mobile No.

In case of any further clarification, kindly contact us. Please note that once the order placed shall  
not be cancelled.

We now look forward to serve you.

Thanking you

Yours faithfully  
For SHIVA ENTERPRISES

DEBASHIS DAS

End: Techno-Commercial Offer.

snm/ dd



# SHIVA ENTERPRISES

Sales & Service of Pumps&sets



34 A, METCALFE STREET, KOLKATA- 700 013 ( Near 15, Ganesh Chandra Avenue)  
Phones:(033)2211-3166,2211-9223/ 2211-8491 \* E-mail : [info@shivapumps.com](mailto:info@shivapumps.com)

Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025.  
Phones:(033)2454-8483,2454-8594 / 2454-2541 \* E-mail: [cc@shivapumps.com](mailto:cc@shivapumps.com)

Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129

Date : 21. 07. 2021

To  
The General Manager  
M/s. ENVIRONMENTAL ENGINEERING SERVICES

## TECHNICAL OFFER

10] 'KISHOR' make Submersible SewagePumpset:- **PUMP HOUSE NO.1**

Description	½ DWF (1W + 1S)	1 DWF (1W + 1S)	2.25 DWF (W)
Make	KISHOR	KISHOR	KISHOR
Pump Model :	ASTRA SA 80-160	ASTRA SA 100-200	ASTRA SA 100-250
Equipment Name	Submersible Sewage Pump	Submersible Sewage Pump	Submersible Sewage Pump
Pump Quantity ( Nos)	02 Nos.	02 Nos.	02 Nos.
Liquid Name	Raw Sewage	Raw Sewage	Raw Sewage
Liquid Temp. (C)	40°	40°	40°
Specific Gravity	1.1	1.1	1.1
Solid Nature	Soft, Non-fibrous	Soft, Non-fibrous	Soft, Non-fibrous
Solid Handling requirement ( mmdiamax.)	0	0	0
Application	Transfer	Transfer	Transfer
Installation	Single Auto Rail Coupling	Single Auto Rail Coupling	Single Auto Rail Coupling
Flow ( m3/hr. )	31	61	136
Head ( m)	9	9	9
Efficiency (%)	70	57	57
Power (bkW)	1.23	2.90	5.81
Recom. Motor Rating	1.5 kW / 2.0 H.P.	3.75 kW / 5.0 H.P.	7.5 kW / 10 H.P.
Rated speed (RPM)	1450	1450	1450
Voltage	415V ±10%	415V ±10%	415V ±10%
Frequency	50 Hz. ±3%	50 Hz. ±3%	50 Hz. ±3%
Insulation	F Class	F Class	F Class
Protection	IP 68	IP 68	IP 68
Cable size	1X 7 X 1.5 Sq. mm	1X 7 X 1.5 Sq. mm	1x10X1.5 Sq. mm
Starting Method	D.O.L.	D.O.L.	Star Delta
Impeller Type	Closed	Semi Open (F)	Semi Open (F)
Sphere Passing size ( mmDiaMax.)	75	80	100
Del. Flange Dia ( mm)	80	100	100
Del. Flange Std.	IS:6392-1971	IS:6392-1971	IS:6392-1971
Curve No.	KE/PPC/ACR152M10/R0	KE/PPC/ACR163M10/R0	KE/PPC/ACR164M10/R0
Motor Protections			
1. Winding Overheating Protection	2. Mechanical Seal leakage protection	3. TherminalChamber moisture protection	
5. Low Liquid Level Protection	6. High Liquid Level Sensor Electrode	4. Reverse Rotation Protection ( not available for 90 frame motors)	
MOC	Material	Material	Material
Casing	1 Set	NiCI	NiCI
Impeller	1 No.	CF 8M	CF 8M
Shaft	1 No.	SS410	SS410
Fasteners Set	1 Set	MSG	MSG
Motor Parts	1 Set	CI	CI
Pump Mechanical Seal	1 No.	SiCvsSiC	SiCvsSiC
Motor Mechanical Seal	1 No.	C vsSiC	C vsSiC
Cable	1 Set	Cu Conductor PVC Sheathed	Cu Conductor PVC Sheathed



Price, Terms & Conditions of supply will be as per enclosed sheets

GST IN : 19AAVFS9885J1ZS:

PAN : AAVFS 9885J

# SHIVA ENTERPRISES

Sales & Service of Pumpscts



34-A, METCALFE STREET, KOLKATA- 700 013 ( Near 15, Ganesh Chandra Avenue)  
Phones:(033)2211-3166,2211-9223/ 2211-8491 \* E-mail : [info@shivapumps.com](mailto:info@shivapumps.com)

Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025.  
Phones:(033)2454-8483,2454-8594 / 2454-2541 \* E-mail: [cc@shivapumps.com](mailto:cc@shivapumps.com)

Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129

Date : 21. 07. 2021

To  
The General Manager  
M/s. ENVIRONMENTAL ENGINEERING SERVICES

## COMMERCIAL OFFER

### PUMP HOUSE NO. 1

Description			½ DWF(1W + 1S)	1 DWF (1W + 1S)	2.25 DWF (W)
Pump Model :			ASTRA SA 80-160	ASTRA SA 100-200	ASTRA SA 100-250
Pump Unit Price :			Rs. 78,800/-	Rs. 1,36,000/-	Rs. 2,02,700/-
Accessories	Qty	Material			
Extra 5 Mtr. Cable	1 Set	Cu Conductor PVC Sheathed	Rs. 1,650/-	Rs. 1,650/-	Rs. 1,650/-
Single Auto RailCoupling	1 Set	DI	Rs. 13,500/-	Rs. 21,000/-	Rs. 21,000/-
Duck Foot Bend	1 No.	CI	Rs. 5,300/-	Rs. 6,600/-	Rs. 6,600/-
Single Guide Rail Pipe	10 Mtr.	MSG	Rs. 3,800/-	Rs. 4,600/-	Rs. 6,200/-
Single Guide Rail Pipe Coupler	1 No.	MSG	Rs. 1,650/-	Rs. 2,000/-	Rs. 2,000/-
Lifting Chain with Bow Shackles	10 Mtr.	Carbon Steel Gr.M4	Rs. 4,100/-	Rs. 4,100/-	Rs. 5,000/-
Pump Controller	1 No.	-	Rs. 66,600/-	Rs. 66,600/-	Rs. 66,600/-
Accessories Value :			Rs. 96,600/-	Rs. 1,06,550/-	Rs. 1,09,050/-



Performance Curve as per enclosed sheets

GST IN : 19AAVFS9885J1ZS:

PAN : AAVFS 9885J

1156

**KISHOR**

Sales Office: [Faint text]

Office: [Faint text]

Works: [Faint text]



Height: [Faint text]

Flow rate (cubic metres per hour)

Efficiency: [Faint text]

Flow rate (cubic metres per hour)

Input Power (kW): [Faint text]

Customer: [Faint text]

End User: [Faint text]

Consulted:

Plant Project:

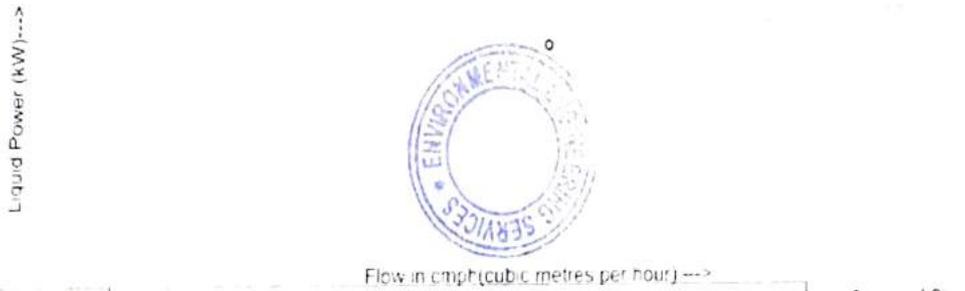
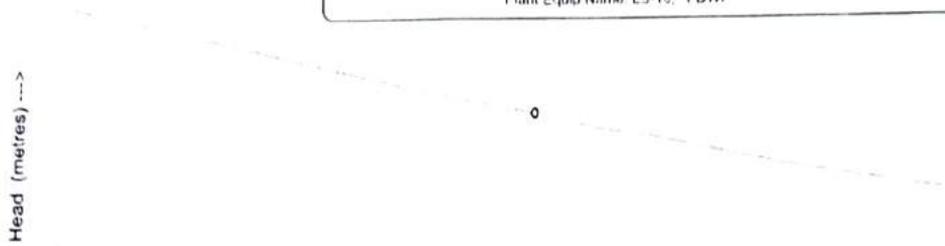
Quotation No: [Faint text]

Approval Stamp



<b>KISHOR</b>	
<b>Sales</b>	HEAD OFFICE: A-11, H BLOCK, CT MID.C, PIMPRI, PUNE 411 018, INDIA
<b>Office</b>	Tel: 020-27472616, 27473570 Fax: 020-27470616 India Code: +91 e-mail: info@kishorpumps.com
<b>Works</b>	KISHOR PUMPS PVT. LTD., Chakan Plant, 675/2, Pune Nashik Highway, Kuruli, Chakan, Pune 410501, INDIA. (91) 9319659196/9319659133/9319659133

<b>Duty Point</b>	Pump Model: ASTRA SA 100-200	Pump Quantity: 2 (NOS)
Flow: 69 (m <sup>3</sup> /hr)	Motor Speed: 1450 (rpm)	Pump Power (kW): 2.90 kW
Head: 8.0 (m)	Motor Rating: 3.75 kW / 5hp	Pump Efficiency (%): 57
	Plant Equip Name: LS-10, 1 DWF	



<b>Customer</b>	Shiva Enterprises	
<b>End User</b>	Kolkata Metropolitan Development Authority	
<b>Consultant</b>		
<b>Plant/Project</b>	Flow Unit at Kestopur Canal	
<b>Quotation Nr</b>	KSP/02/01N/1992/KMB/101/21	Date: 04.04.2011

Approval Stamp

For Company

1158

<b>KISHOR</b>		
<b>Sales</b>	KISHOR PUMP, A-11, M BLOCK, ...	
<b>Office</b>	Tel: 080 27472616, 27472617 Fax: 080 27472618	
<b>Works</b>	KISHOR PUMPS PVT. LTD., Hubballi Road, BTL, ...	
<b>Duty Point</b>	Pump Model: KST105 TA 10/24 Flow: 138 m <sup>3</sup> /hr Head: 8.0 m	Pump Capacity: 138 m <sup>3</sup> /hr Motor Speed: 1450 rpm Motor Rating: 7.5 kW / 10 hp Pump Rating: 10/24 Plant Equip Name: 10/24 DWT

Head (metres) --->

Flow in cmph(cubic metres per hour) --->

Efficiency (%) --->

Flow in cmph(cubic metres per hour) --->

Liquid Power (KW) --->

Flow in cmph(cubic metres per hour) --->

<b>Customer</b>	Shiva Enterprises
<b>End User</b>	Kolkata Metropolitan Development Authority
<b>Consultant</b>	
<b>Plant/Project</b>	Project at Kolkata
<b>Quotation No.</b>	KP/ENG/10/24/2018/001

Date: 16 August 2018

Approval Stamp

For Company



1159

# SHIVA ENTERPRISES

Sales & Service of Pumpsets



34-A, METCALFE STREET, KOLKATA- 700 013 ( Near 15, Ganesh Chandra Avenue)  
Phones:(033)2211-3166,2211-9223/ 2211-8491 \* E-mail : [info@shivapumps.com](mailto:info@shivapumps.com)

Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025.  
Phones:(033)2454-8483,2454-8594 / 2454-2541 \* E-mail: [cc@shivapumps.com](mailto:cc@shivapumps.com)

Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129  
Date : 21. 07. 2021

To  
The General Manager  
M/s. ENVIRONMENTAL ENGINEERING SERVICES  
Infinity Think Tank, Tower-II,  
Ground Floor, Unit-102, Sector-V,  
Salt Lake City,  
Kolkata- 700091  
Mobile : 9830068733  
E-mail : [ajeet@eesindia.net](mailto:ajeet@eesindia.net), [abhijitpaul@eesindia.net](mailto:abhijitpaul@eesindia.net)

SITE : K.M.D.A. SANTRAGACHI JHEELK PROJECT FOR PUMP HOUSE NO. 1

Kind Attn. : Mr. Abhijit Paul ( 9038992098)

Dear Sirs,

Sub : Budgetary Techno-Commercial Offer of "KISHOR" make Non- Clog  
Submersible Sewage Pumpset A/c. K.M.D.A Kestopur Canel for Pump  
House No. 1to14 against your e-mail enquiry dtd.18.07.2019.

We thank you for your above valued enquiry and subsequent visit of Mr. S.N. Mukherjee-  
Marketing Consultant on dtd. 27.07.2019 and you confirmed the details of pump requirement  
on dtd.29.07.2019.

We have pleasure to submit our Technical Offer for "KISHOR" make Submersible Sewage  
Pumpsets with Performance Curve in separate sheet against your above requirement. Kindly  
note that we are Authorized Regional Sales & Service Dealer of "KISHOR" make Pumps.

We trust, you will find our offer quite competitive and in line to your requirement and shall  
favour us with your valued order, which shall receive our best attention.

Kindly furnish the following particulars along with your valued order: 1]

- GSTNO.
- 2] TINNO.
- 3] PAN NO.
- 4] E-mail No.
- 5] Name of Contact Person
- 6] Mobile No.

In case of any further clarification, kindly contact us. Please note that once the order placed shall  
not be cancelled.

We now look forward to serve you.

Thanking you

Yours faithfully  
For SHIVA ENTERPRISES

DEBASHIS DAS

Encl: Techno-Commercial Offer.

snm/ dd



# SHIVA ENTERPRISES

Sales & Service of Pumpsets



34-A, METCALFE STREET, KOLKATA 700 013 ( Near 15, Ganesh Chandra Avenue)  
 Phones:(033)2211-3166,2211-9223/ 2211-8491 \* E-mail : [info@shivapumps.com](mailto:info@shivapumps.com)

Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025.  
 Phones:(033)2454-8483,2454-8594 / 2454-2541 \* E-mail: [cc@shivapumps.com](mailto:cc@shivapumps.com)

Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129

Date : 21. 07. 2021

To  
 The General Manager  
 M/s. ENVIRONMENTAL ENGINEERING SERVICES

## TECHNICAL OFFER

10] 'KISHOR' make Submersible SewagePumpset:- **PUMP HOUSE NO.1**

Description	½ DWF (1W + 1S)	1 DWF (1W + 1S)	2.25 DWF (W)
Make	KISHOR	KISHOR	KISHOR
Pump Model :	ASTRA SA 80-160	ASTRA SA 100-200	ASTRA SA 100-250
Equipment Name	Submersible Sewage Pump	Submersible Sewage Pump	Submersible Sewage Pump
Pump Quantity ( Nos)	02 Nos.	02 Nos.	02 Nos.
Liquid Name	Raw Sewage	Raw Sewage	Raw Sewage
Liquid Temp. (C)	40°	40°	40°
Specific Gravity	1.1	1.1	1.1
Solid Nature	Soft, Non-fibrous	Soft, Non-fibrous	Soft, Non-fibrous
Solid Handling requirement ( mmdiamax.)	0	0	0
Application	Transfer	Transfer	Transfer
Installation	Single Auto Rail Coupling	Single Auto Rail Coupling	Single Auto Rail Coupling
Flow ( m3/hr. )	31	61	136
Head ( m)	9	9	9
Efficiency (%)	70	57	57
Power (bkW)	1.23	2.90	5.81
Recom. Motor Rating	1.5 kW / 2.0 H.P.	3.75 kW / 5.0 H.P.	7.5 kW / 10 H.P.
Rated speed (RPM)	1450	1450	1450
Voltage	415V ±10%	415V ±10%	415V ±10%
Frequency	50 Hz. ±3%	50 Hz. ±3%	50 Hz. ±3%
Insulation	F Class	F Class	F Class
Protection	IP 68	IP 68	IP 68
Cable size	1X 7 X 1.5 Sq. mm	1X 7 X 1.5 Sq. mm	1x10X1.5 Sq. mm
Starting Method	D.O.L.	D.O.L.	Star Delta
Impeller Type	Closed	Semi Open (F)	Semi Open (F)
Sphere Passing size ( mmDiaMax.)	75	80	100
Del. Flange Dia ( mm)	80	100	100
Del. Flange Std.	IS:6392-1971	IS:6392-1971	IS:6392-1971
Curve No.	KE/PPC/ACR152M10/R0	KE/PPC/ACR163M10/R0	KE/PPC/ACR164M10/R0
Motor Protections			
1.Winding Overheating Protection	2. Mechanical Seal leakage protection	3.TherminalChamber moisture protection	
5.Low Liquid Level Protection	6. High Liquid Level Sensor Electrode	4. Reverse Rotation Protection ( not available for 90 frame motors)	
MOC	Qty.	Material	Material
Casing	1 Set	NiCI	NiCI
Impeller	1 No.	CF 8M	CF 8M
Shaft	1 No.	SS410	SS410
Fasteners Set	1 Set	MSG	MSG
Motor Parts	1 Set	CI	CI
Pump Mechanical Seal	1 No.	SiCvsSiC	SiCvsSiC
Motor Mechanical Seal	1 No.	C vsSiC	C vsSiC
Cable	1 Set	Cu Conductor PVC Sheathed	Cu Conductor PVC Sheathed



Price, Terms & Conditions of supply will be as per enclosed sheets

GST IN : 19AAVFS9885J1ZS:

PAN : AAVFS 9885J

# SHIVA ENTERPRISES

Sales & Service of Pumpsets



34 A, METCALFE STREET, KOLKATA 700 013 ( Near T5, Ganesh Chandra Avenue)

Phones:(033)2211 3166,2211 9223/ 2211 8491 \* E mail : info@shivapumps.com

Customer Care Centre : 81/3, Harish Chatterjee Street, Kolkata- 700 025

Phones:(033)2454 8483,2454-8594 / 2454-2541 \* E-mail: cc@shivapumps.com

Visit us : [WWW.SHIVAPUMPS.IN](http://WWW.SHIVAPUMPS.IN)

Ref : 184 / W/129

Date : 21. 07. 2021

To  
The General Manager  
M/s. ENVIRONMENTAL ENGINEERING SERVICES

## COMMERCIAL OFFER

### PUMP HOUSE NO. 1

Description	1/2 DWF(1W + 1S)	1 DWF (1W + 1S)	2.25 DWF (W)
Pump Model :	ASTRA SA 80-160	ASTRA SA 100-200	ASTRA SA 100-250
Pump Unit Price :	Rs. 78,800/-	Rs. 1,36,000/-	Rs. 2,02,700/-
Accessories	Qty	Material	
Extra 5 Mtr. Cable	1 Set	Cu Conductor PVC Sheathed	Rs. 1,650/-
Single Auto Rail Coupling	1 Set	DI	Rs. 13,500/-
Duck Foot Bend	1 No.	CI	Rs. 5,300/-
Single Guide Rail Pipe	10 Mtr.	MSG	Rs. 3,800/-
Single Guide Rail Pipe Coupler	1 No.	MSG	Rs. 1,650/-
Lifting Chain with Bow Shackles	10 Mtr.	Carbon Steel Gr.M4	Rs. 4,100/-
Pump Controller	1 No.	-	Rs. 66,600/-
Accessories Value :			Rs. 96,600/-



Performance Curve as per enclosed sheets

GST IN : 19AAVFS9885J1ZS:

PAN : AAVFS 9885J

1162

**KISHOR**

Sales Office Works

Office Works

Works

Quantity: 2 nos.

Make: Sanyo

Model: Sanyo

Capacity: 1400 lph

Efficiency: 75%

Head (metres)

Efficiency (%)

Flow in cmph(cubic metres per hour) →

Flow in cmph(cubic metres per hour) →

Customer: \_\_\_\_\_

End User: \_\_\_\_\_

Consulted: \_\_\_\_\_

Plant/Project: \_\_\_\_\_

Quotation No: \_\_\_\_\_

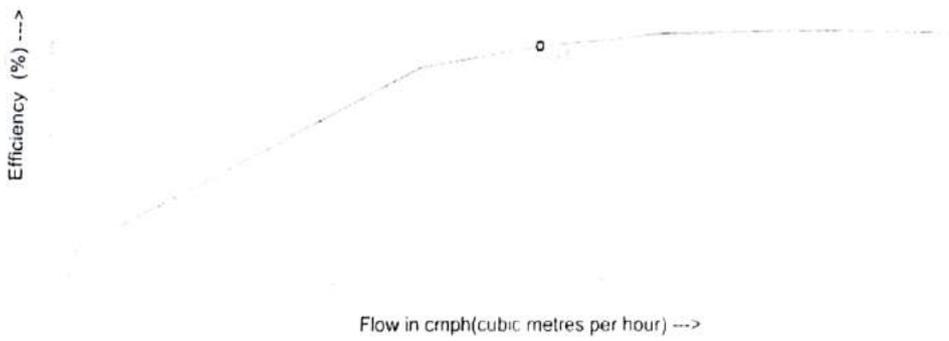
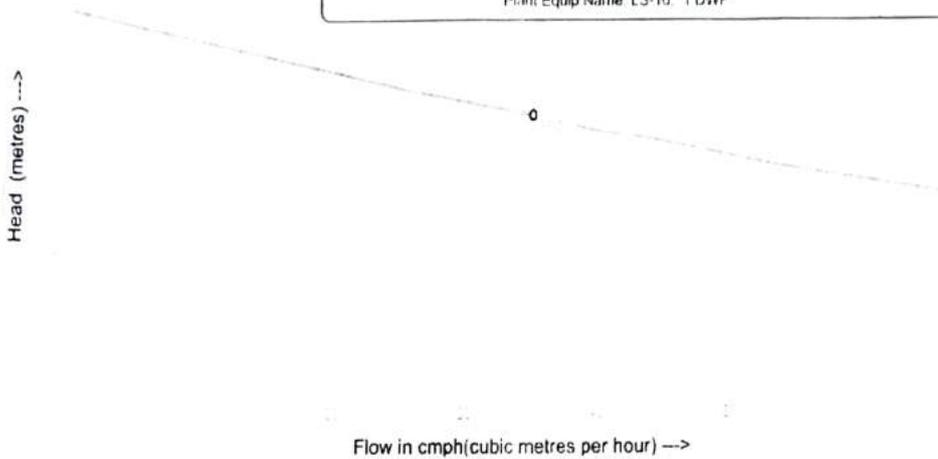
Date: \_\_\_\_\_

Approval Stamp



<b>KISHOR</b>	
Sales	HEAD OFFICE: A-13, H BLOCK / 1, MID.C., PIMPRI, PUNE 411 016 INDIA
Office	Tel: 020-27472616, 27473570 Fax: 020-27470616 India Code: +91 e-mail: info@kishorpumps.com
Works	KISHOR PUMPS PVT. LTD., Chakan Plant, 675/2, Pune Nashik Highway, Kuruli, Chakan, Pune 410501, INDIA. GN: U31909PN1965PTC013333

<b>Duty Point</b>	Pump Model: ASTRA SA 100-200	Pump Quantity: 2 (NOS)
Flow 69 (m <sup>3</sup> /hr)	Motor Speed: 1450 (rpm)	Pump Power (kW): 2.90 kW
Head 8.0 (m)	Motor Rating: 3.75kW / 5hp	Pump Efficiency (%): 57
	Plant Equip Name: LS-10, 1 DWF	



Customer	Shiva Enterprises		
End User	Kolkata Metropolitan Development Authority		
Consultant			
Plant/Project	Flow 100 m <sup>3</sup> /hr		
Quotation No	KA/MS/11/11/2008/001/01/01	Date	06 Aug 2008

Approval Stamp

For Company



1165

Ref: QTN/AP/AS/BK/2018-19/0745

29<sup>TH</sup> AUGUST '2018

**TO,  
ENVIRONMENTAL ENGINEERING SERVICES  
INFINITY THINK TANK, TOWER-II,  
GROUND FLOOR, UNIT- 102,  
SECTOR- V, SALLAKE CITY,  
KOLKATA – 700 091.**

**Kind Attn: Mr. Abhijit Paul – Environmental Engineer.**

**SUB: Offer for 40KVA/45KVA/62.5KVA/82.5KVA, 3Phase Silent D.G. Set  
With Manual Control Panel.**

Dear Sir,

We refer to your requirement for above Diesel Generator Set and take pleasure to submit our detailed offer for the same in separate annexed sheets for your kind consideration.

Please note that we have offered you **ASHOK LEYLAND** make "**LEPOWER**" brand Silent DG Set, **which is most fuel efficient, aesthetically designed, meeting latest CPCB-II norms and are powered by the compact, trouble free performance Ashok Leyland series Diesel Engines ensuring minimum maintenance and low operating costs.** Our country-wide service dealer network ensures prompt service and spare parts support throughout India.

**Advantage of Ashok Leyland make LEPOWER brand D.G. Set.**

- Robust, Compact, Fuel efficient Diesel Generator sets designed to operate under arduous site conditions
- Latest Technology & Highly Reliable
- Highly Engineered for Optimized Power Solution
- **Designed to operate continually 24 x 7 @ 100% load output.**



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- Better Fuel Consumption
- Low Running cost
- Compact Foot Print
- Easy access for maintenance
- **600 hours/ 12 Months lube oil changed period.**
- **Sales & Service available under the same roof.**
- **24 months or 5000 operational hours (Overall D.G. Set),** whichever is earlier against any manufacturing defect provided manufacturers recommended lube oil, coolant and genuine spare parts are used.

We hope you will find our offer most competitive and look forward to receiving your valued order at an early date.

We hope you will find our offer most competitive and look forward to receiving your valued order at an early date.

Thanking you,  
Yours faithfully,  
For **AMAZE POWER**

**ALOKESH SARKAR**  
**CLUSTER HEAD**  
**POWER SOLUTION BISUNESS**  
**MOBILE:9674972022.**



**TECHNICAL SPECIFICATION**

**40KVA/45KVA/62.5KVA SILENT D.G.SET 415 VOLT, 3PH, 50 HZ, 0.8PF AT 1500RPM POWERED BY ASHOK LEYLAND ENGINE COUPLED WITH LEYPOWER MAKE BRUSHLESS ALTERNATOR, FUEL TANK, BATTERY 12 VOLT, RESIDENTIAL SILENCER AND MANUAL CONTROL PANEL.**

<b>Engine Rating</b>	<b>40KVA/45KVA</b>	<b>62.5KVA</b>
Make	Ashok Leyland	Ashok Leyland
Model	AL4CTIDG1	AL4CTIDG2
B.H.P.	52.28	79.09
Stroke	4	4
No. of Cylinders	4	4
RPM	1500	1500
Cyl. Configuration	Inline	Inline
Direction of Rotation	Clockwise viewed from flywheel end	Anti-Clockwise viewed from flywheel end
Method of aspiration	Turbo charged	Turbocharged after cooled
Method of cooling	Coolant cooled	Coolant cooled
<b>Type of Governor</b>	<b>Electronic</b>	<b>Electronic</b>
Starting system	12V Electric Start	12V Electric Start
Overload capacity	10% for 1hr. for every 12hrs. running	10% for 1hr. for every 12hrs. running
<b>Duty</b>	<b>Continuous</b>	<b>Continuous</b>
Safety control	Low lube oil pressure High coolant temp.	Low lube oil pressure High coolant temp. Over speed
Applicable Standards	ISO 3046,BS 5514	ISO 3046,BS 5514
<b>Lube oil changed period</b>	<b>600 hours./12 Months</b>	<b>600 hours./12 Months</b>

**ALTERNATOR**

<b>Make</b>	<b>: LEYPOWER</b>
Rating	: 40KVA/45KVA/62.5KVA
KW	: 32KW/36KVA/50KW
Type	: Brushless
Excitation	: Self excited, self regulated (AVR)
Enclosure	: SPDP
Enclosure protection	: IP-23
Rated Voltage	: 415V
No. of Phases	: 3
Frequency	: 50Hz
Power Factor	: 0.8 (lag)
Rated current	: 55.65Amps./62.61Amps/86.95Amps.
Class of Insulation	: H
Voltage Regulation	: $\pm 1\%$
Overload capacity	: 10% for 1hr. for every 12hrs. running.
Applicable standards	: IS 4722/BS 5000



**TECHNICAL SPECIFICATION**

**82.5KVA SILENT D.G.SET 415 VOLT, 3PH, 50 HZ, 0.8PF AT 1500RPM POWERED BY ASHOK LEYLAND SERIES ENGINE COUPLED WITH LEYPOWER MAKE BRUSHLESS ALTERNATOR FITTED ON COMMON MS BASE COMPLETE WITH FUEL TANK 140 LTRS CAPACITY, BATTERY, RESIDENTIAL SILENCER AND STANDARD MANUAL CONTROL PANEL.**

<b>Engine Rating</b>	<b>82.5KVA</b>
Make	Ashok Leyland
Model	AL4CTIDG3
B.H.P.	104.56
Stroke	4
No. of Cylinders	4
RPM	1500
Cyl. Configuration	Inline
Direction of Rotation	Anti-Clockwise viewed from flywheel end
Method of aspiration	Turbocharged after cooled
Method of cooling	Coolant cooled
<b>Type of Governor</b>	<b>Electronic</b>
Starting system	12V Electric Start
Overload capacity	10% for 1hr. for every 12hrs. running
Duty	Continuous
Safety control	Low lube oil pressure High coolant Temp.
Applicable Standards	ISO 3046,BS 5514

**ALTERNATOR**

<b>Make</b>	:	<b>LEYPOWER</b>
Rating	:	82.5KVA
KW	:	66KW
Type	:	Brushless
Excitation	:	Self excited, self regulated (AVR)
Enclosure	:	SPDP
Enclosure protection	:	IP-23
Rating	:	Continuous
Rated current	:	114.78Amps
Rated Voltage	:	415V
Frequency	:	50Hz
Power factor	:	0.8pf.
Class of Insulation	:	H
Voltage Regulation	:	±1%
Overload capacity	:	10% for 1hr. for every 12hrs. running.
Applicable standards	:	IS 4722/BS 5000



### **MANUAL STANDARD CONTROL PANEL**

Control panel shall be made of CRCA Sheet, floor mounted, indoor type, dust and vermin proof and powder coated and suitable for 415V, 3Phase, 50Hz system. The panel shall consist of the following features:

- Aluminium Bus Bar of suitable capacity.
- Digital type Multifunction Meter for measuring Volts/Amps/Frequency /Power Factor.
- Monitor with display of engine safety features.
- Current Transformers of suitable ratio.
- MCB/HRC Fuses for control protection.
- Indicating Lamps for DG ON/Load ON.
- Moulded Case Circuit Breaker of suitable rating with short circuit and overload protection.
- Earth Studs
- Engine Start/Stop Key.

### **ACOUSTIC ENCLOSURE**

Acoustic enclosure shall be made of specially procured CRCA Sheet and structural sheet metal Base frame and comply with CPCB norms with following features:

- The most compact, six sided close, modular construction and detachable.
- Meet CPCB / MOEF norms.
- Sound level < 75 dBA at one meter distance.
- Easy accessibility around the DG Set, which ensures optimum serviceability.
- Special power coated enclosure, weather proof, corrosion resistant, environment friendly.
- Specially designed lifting hooks.
- Use of high quality hardware ensures longer life of enclosure.
- Provision for emergency stop facility.
- Fuel tank is specially designed and mounted inside of the enclosure as a integral part of Acoustic enclosure.

### **DIMENSIONS : (Without Silencer):**

- 1) For 40KVA/45KVA DG Set: L: 2500, W: 1100, H: 1380mm  
 2) For 62.5KVA/82.5 DG Set: L: 2800, W: 1200, H: 1400mm



**PRICE SCHEDULE :**

1)	Price for 40KVA, Silent D.G. Set with Manual Control Panel( <b>CPCB – II Engine</b> ).	: Rs.4,28,625/- Each Set
	GST @18%	: Rs. 77,153/-
	Total Price	: Rs. 5,05,778/-
	<b>Special discounted price including GST.</b>	: <b>Rs. 4,50,000/-</b>
2)	Price for 45KVA, Silent D.G. Set with Manual Control Panel( <b>CPCB-II Engine</b> ).	: Rs.4,42,125/-Each Per Set
	GST @ 18%	: Rs. 79,583/-
	Total Price	: Rs.5,21,708/-
	<b>Special discounted price including GST.</b>	: <b>Rs. 4,65,000/-</b>
3)	Price for 62.5KVA, Silent D.G. Set with Manual Control Panel( <b>CPCB – II Engine</b> ).	: Rs.4,92,750/-Each Set
	GST @18%	: Rs. 88,695/-
	Total Price	: Rs. 5,81,445/-
	<b>Special discounted price including GST.</b>	: <b>Rs. 5,15,000/-</b>
4)	Price for <b>82.5KVA</b> , Silent D.G. Set with Manual Control Panel( <b>CPCB-II Engine</b> ).	: Rs. 5,73,750/- Per Set.
	Add GST @18%	: Rs. 1,03,275/-
	Total	: Rs. 6,77,025/-
	<b>Special discounted price including GST.</b>	: <b>Rs. 6,15,000/-</b>
5)	<b>Transportation Charges.</b>	: <b>Ex-Sankrail, Howrah basis.</b>

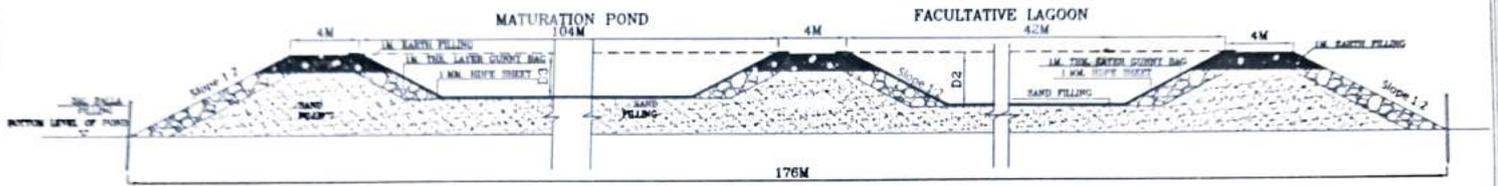
**COMMERCIAL TERMS & CONDITIONS**

Payment	:	25% advance along with the order. Balance 75% against proforma invoice prior to dispatch.
Delivery	:	<b>Ready stock subject to prior sale.</b> Alternatively, within 4-6 weeks from the date of receipt of confirmed order along with advances.
Warranty	:	24 months or 5000 operational hours, whichever is earlier against any manufacturing defect provided manufacturers recommended lube oil, coolant and genuine spare parts are used.
Statutory changes	:	Taxes ruling at the time of dispatch will be applicable.
Validity	:	30 days from the date of this offer.
Disputes	:	All disputes are subject to Kolkata High Court Jurisdiction.

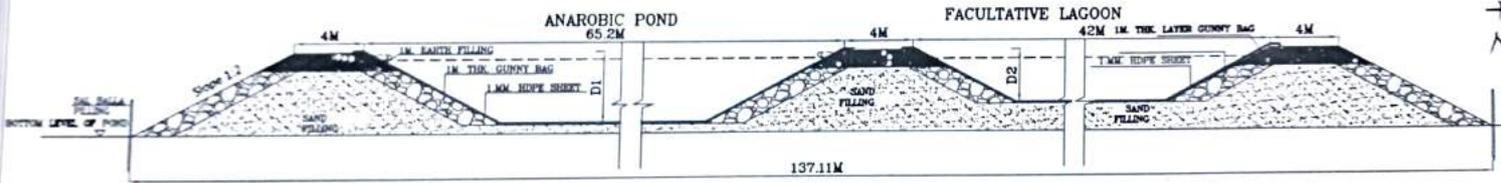


# Drawing





ALL EMBANKMENTS SECTION BB



ALL EMBANKMENTS SECTION AA

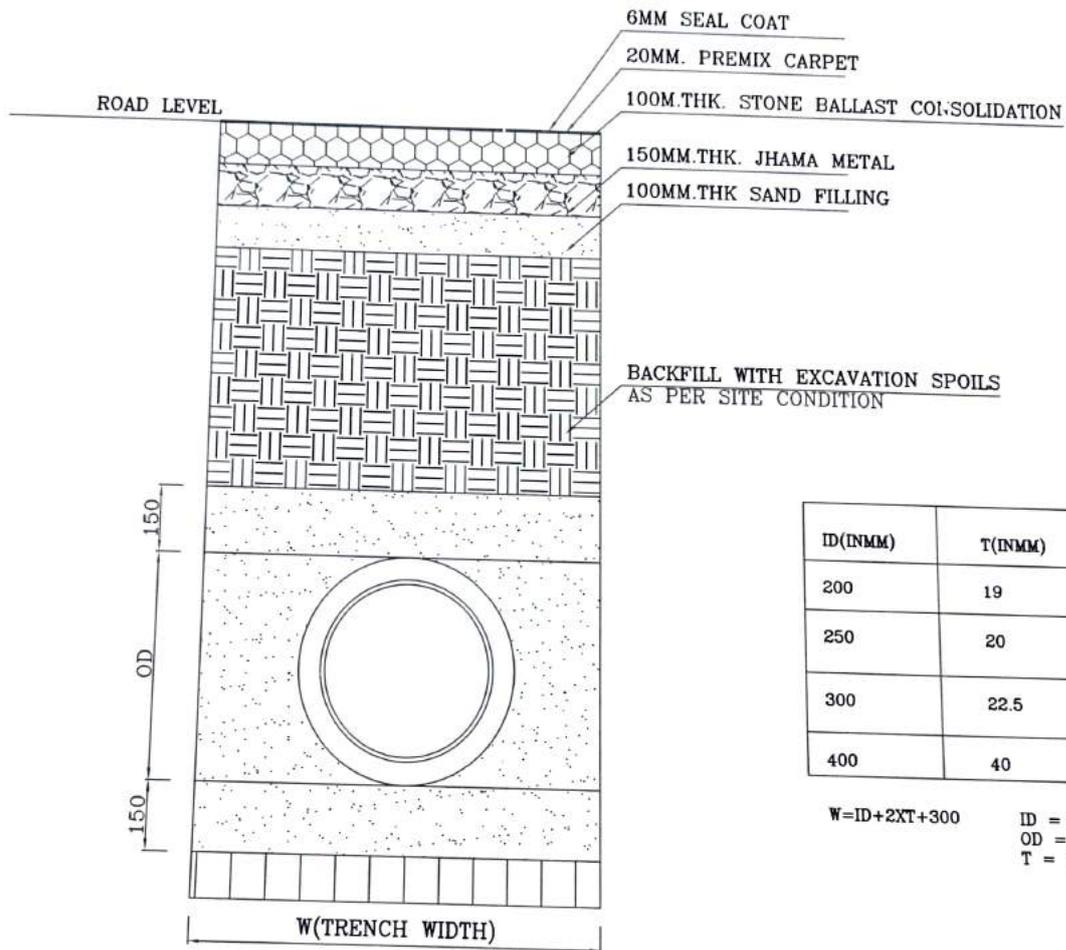
1172



TREATMENT UNIT	ANAEROBIC POND(D1)	FACULTATIVE LAGOON(D2)	MATURATION POND(D3)
DEPTH-(METER)	4.5M	3.0M	2.5M

Drawing No-1  
 drawing No-2

# BEDDING DETAILS OF DWC PE PIPE WITH BITUMINOUS ROAD RESTORATION



ID(INMM)	T(INMM)	TRENCH WIDTH (W IN.MM)
200	19	0.538
250	20	0.538
300	22.5	0.645
400	40	0.780

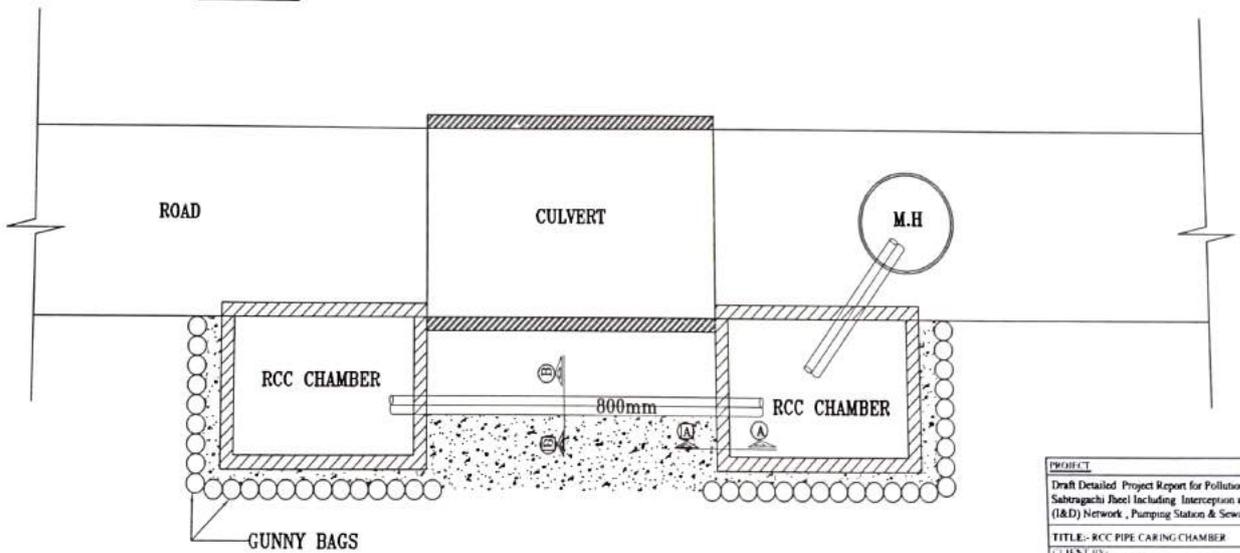
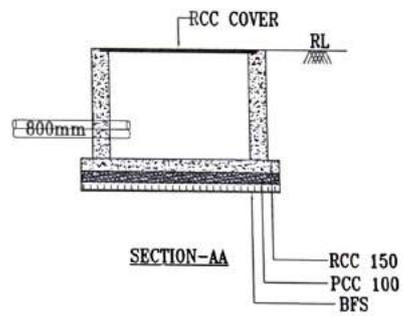
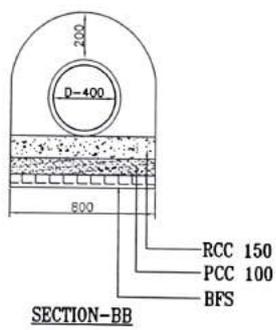
$W = ID + 2XT + 300$

ID = INNER DIA  
 OD = OUTER DIA  
 T = THICKNESS OF PIPE



1173

RCC PIPE CARING CHAMBER



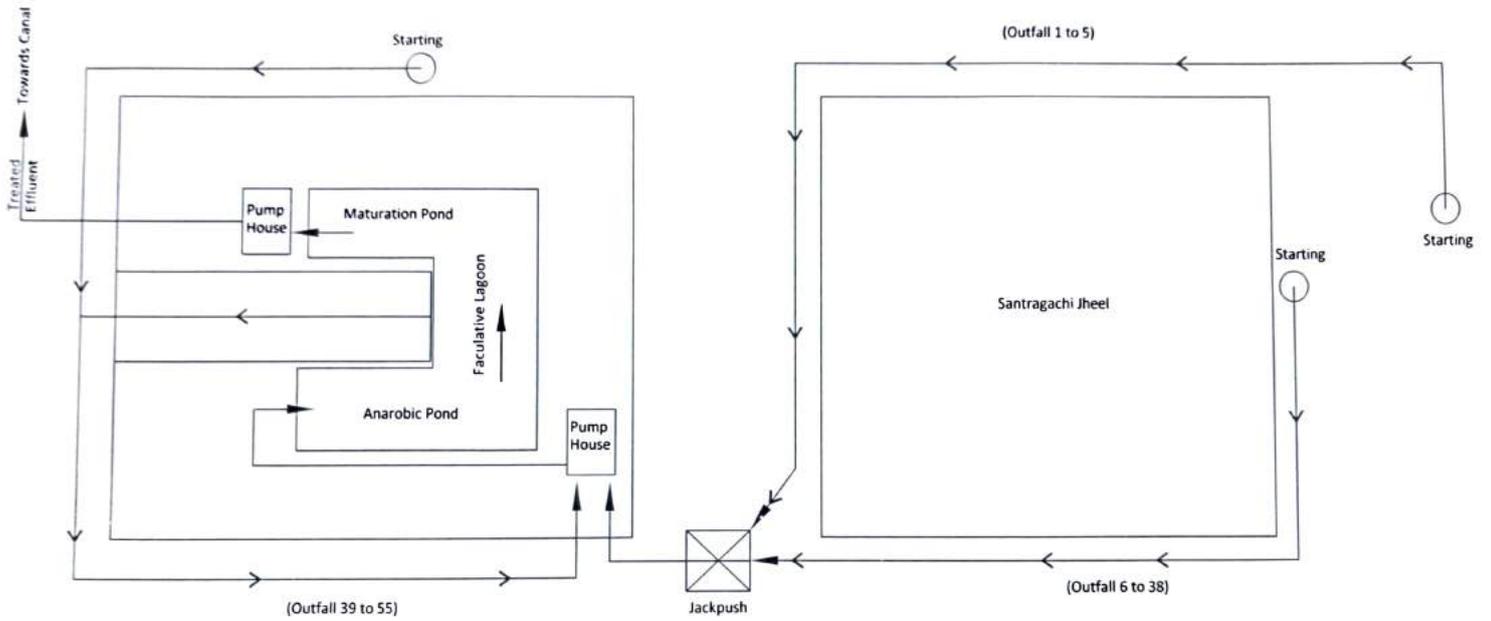
PLAN

h711

<b>PROJECT</b>	
Draft Detailed Project Report for Pollution Abatement at Sabtragachi Jheel Including Interception and Diversion (I&D) Network, Pumping Station & Sewage Treatment Plant	
<b>TITLE:-</b> RCC PIPE CARING CHAMBER	
<b>CLIENT (S):</b>	
KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY	
<b>PREPARED BY:</b>	
ENVIRONMENTAL ENGINEERING SERVICES	
	<b>OPTIONAL: ENGINEERING SERVICE</b> 100, FORT ROAD, 7TH FLOOR, TRIPURA TOWER, CP BAGICHA, CALCUTTA-700016

Drawing No-3

SCHEMATIC DIAGRAM OF PROPOSED FACILITIES FOR POPULATION ABATMENT PROJECT OF SANTRAGACHI JHEEL.

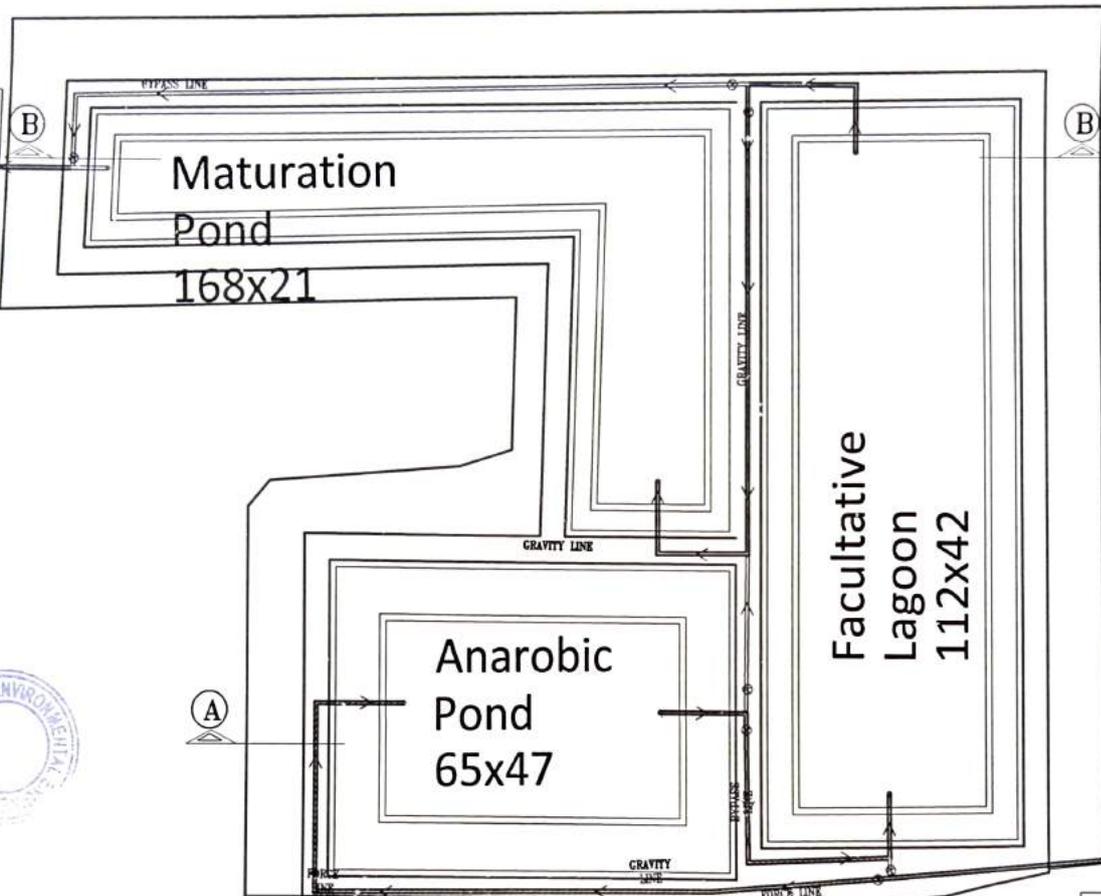


NO. 1175	
Draft Detailed Project Report for Pollution Abatement at Santragachi Jheel including Interception and Diversion (I&D) Network, Pumping Station & Sewage Treatment Plant	
TITLE - SCHEMATIC DIAGRAM	
CLIENT - BIL	
RAJKATA METROPOLITAN DEVELOPMENT AUTHORITY	
PREPARED BY:	
SERVICE DIVISION - ENVIRONMENTAL SERVICES	
	APPROVED BY: _____ DATE: _____

Drawing No-4

1175

Pump House



(A)

(B)

Pump House

(A)

BYPASSER PIPE LINE LENGTH = 150 METER  
 GRAVITY PIPE LINE LENGTH = 195 METER  
 FORCE PIPE LINE LENGTH = 195 METER

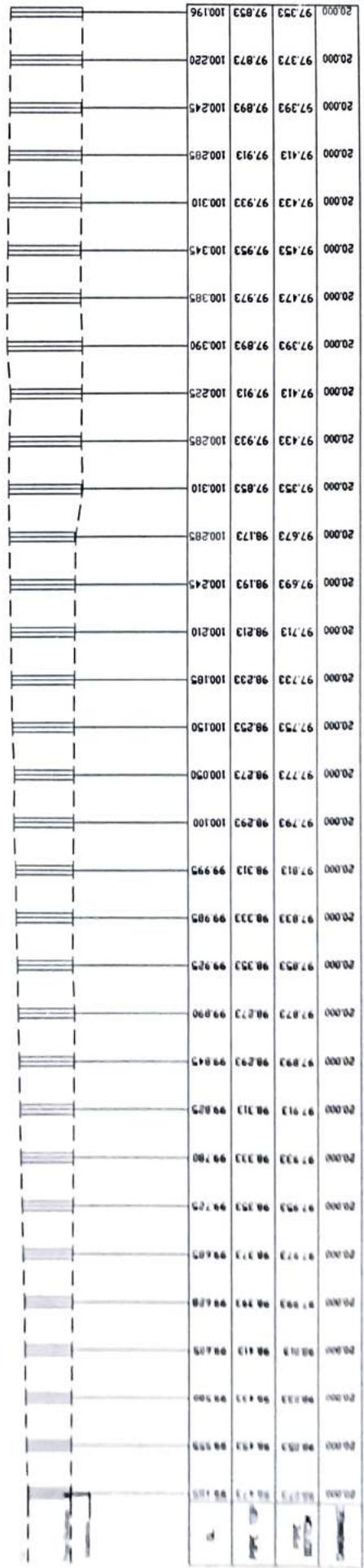
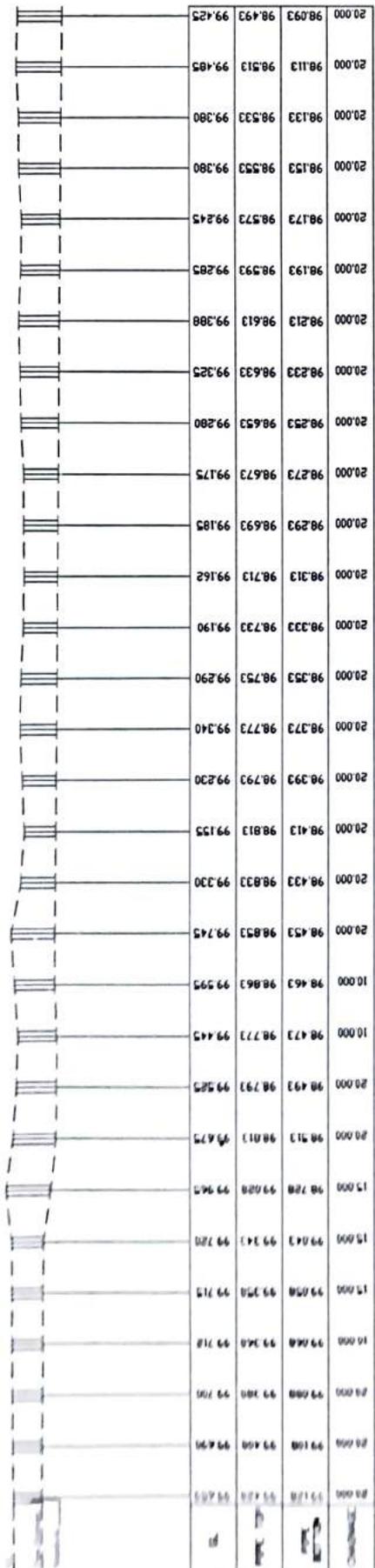
WSP LAYOUT PLAN

Drawing NO-5

116

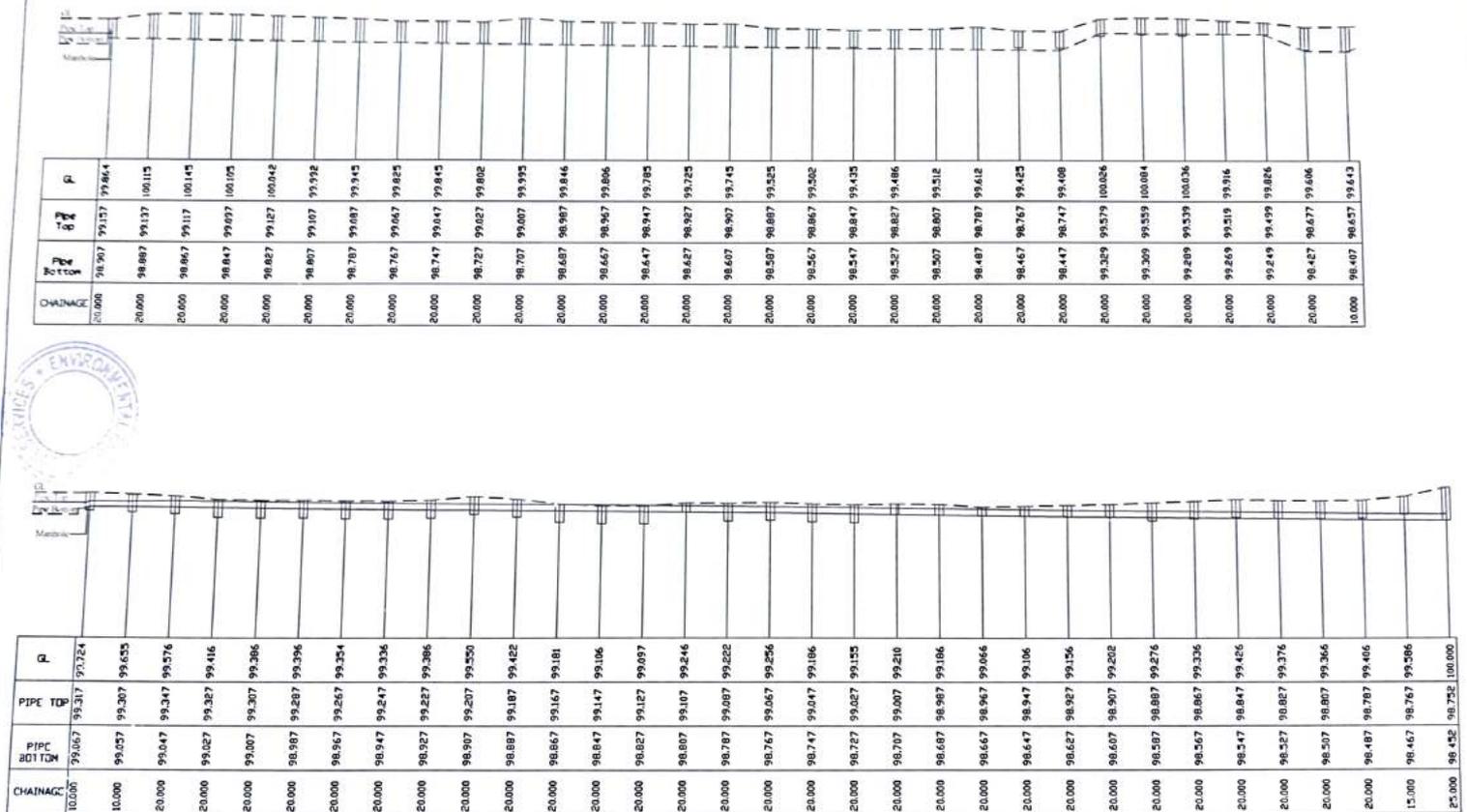
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Road Longitudinal Section-1

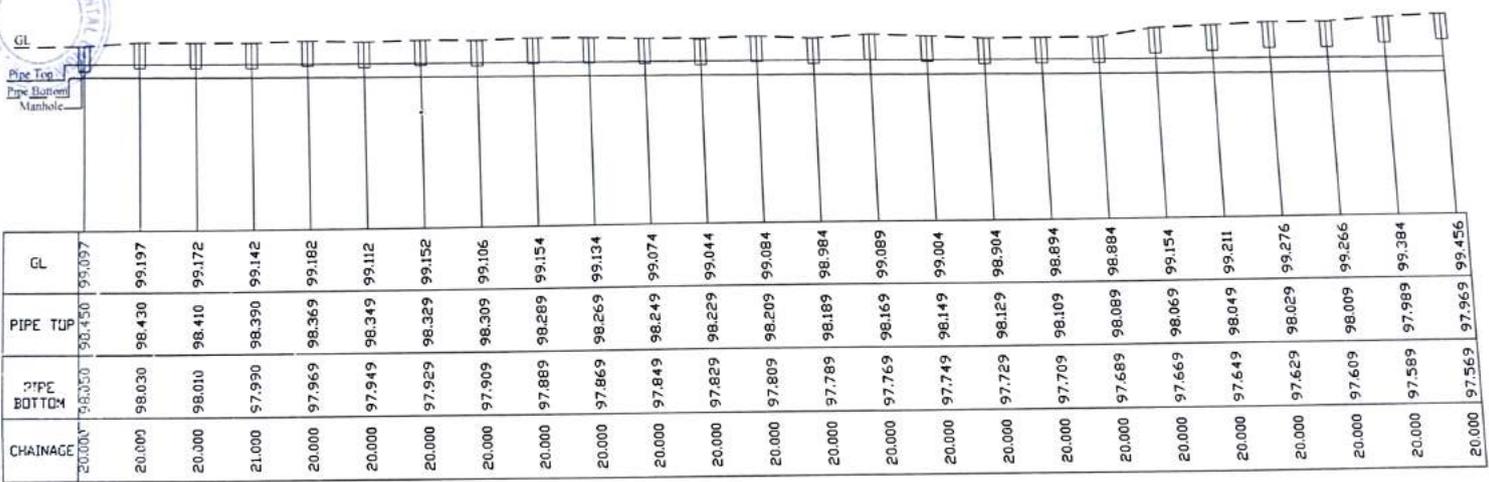
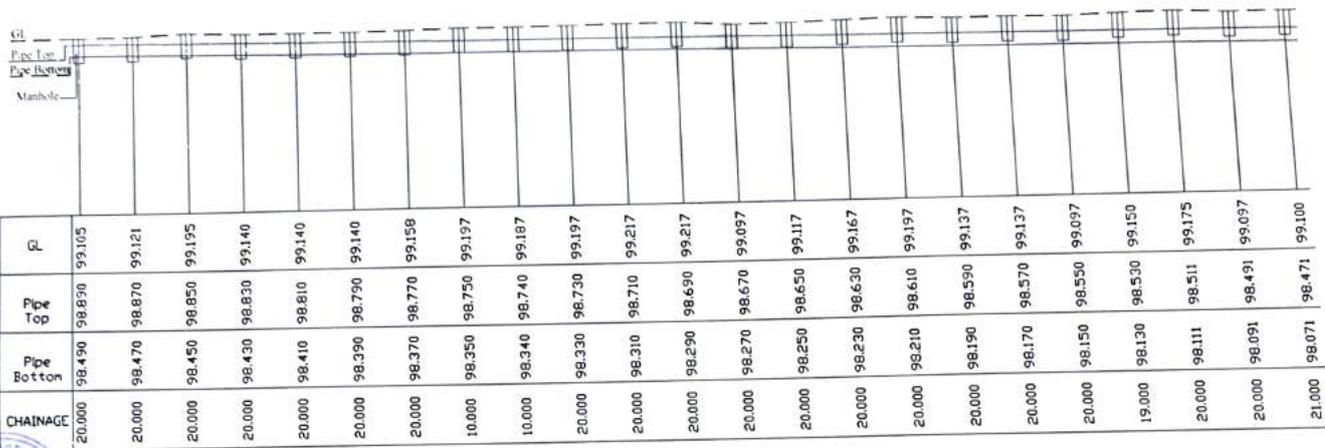


Drawing NO-6

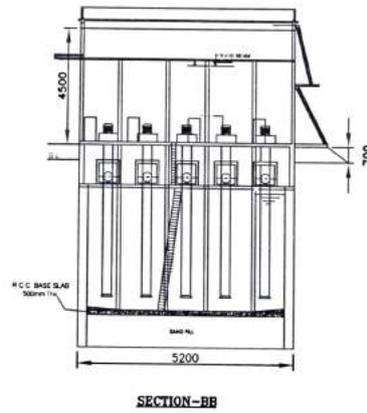
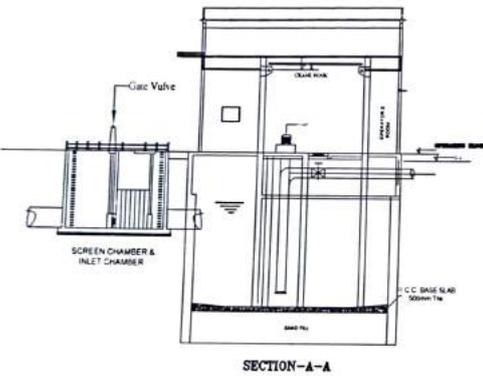
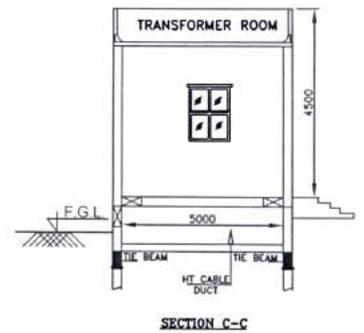
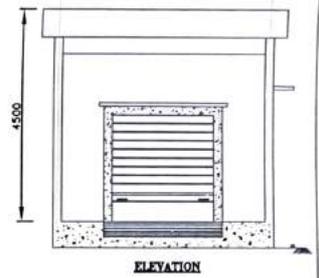
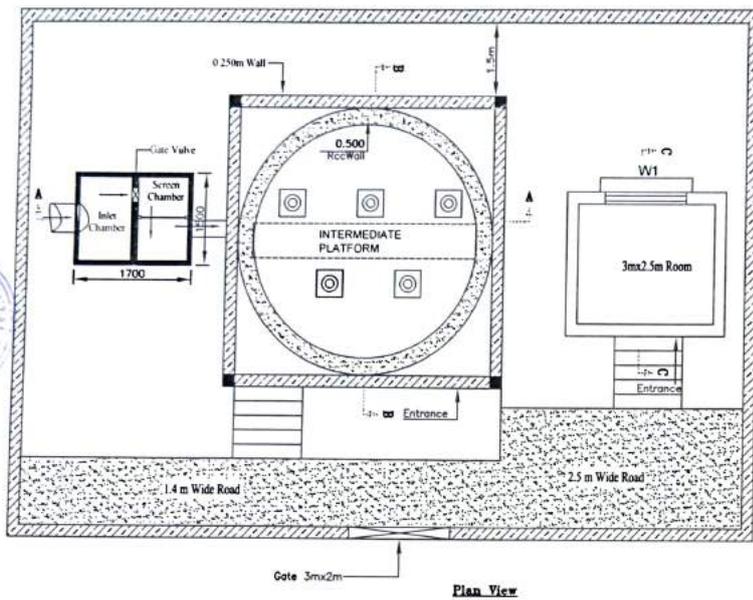
## Road Longitudinal Section-2



## Road Longitudinal Section-3



6711



CLIENT:-  
KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY

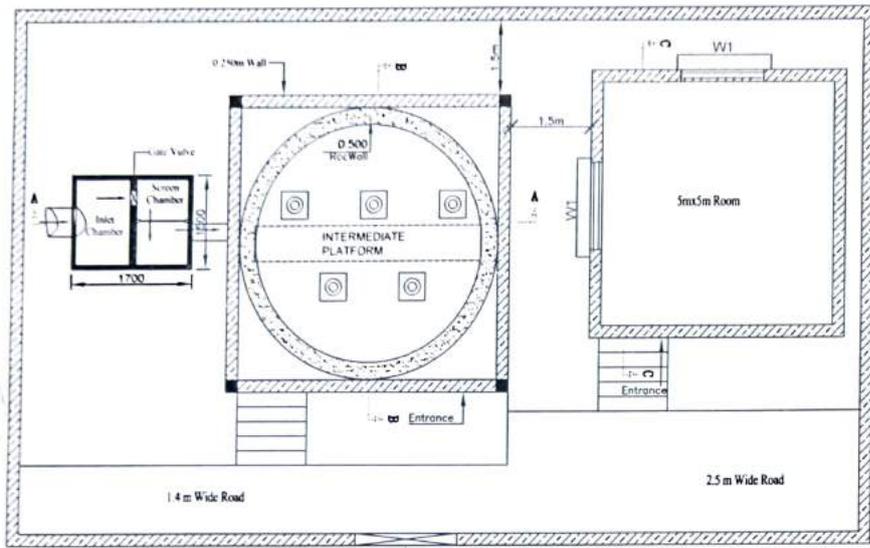
PROJECT:-  
SANTRAGACHI I&D DPR PROJECT

FILED:-  
New Proposed IS Inlet (1.5MID)

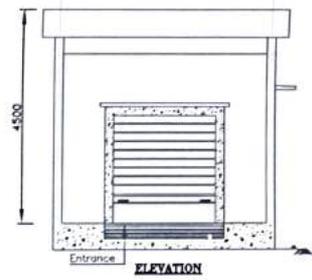
DESIGNED	CHECKED	APPROVED
SHEET	SCALE	REVISION

Drawing No-9

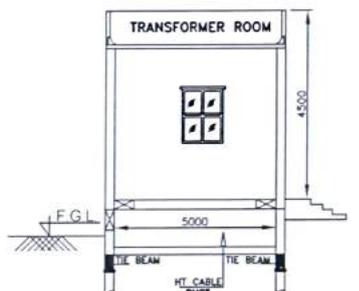
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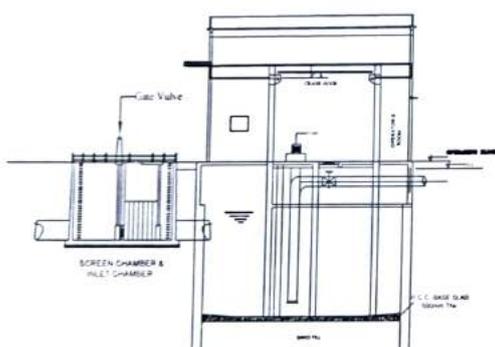
Plan View



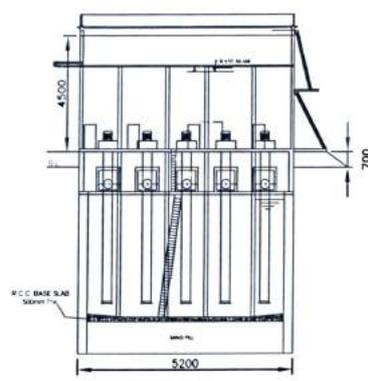
ELEVATION



SECTION C-C



SECTION-A-A



SECTION-BB

GROUP -		KOLKATA METROPOLITAN DEVELOPMENT AUTHORITY	
PROJECT -		SANTRAGACHI I&D DFR PROJECT	
DATE -	Rev. Proposed 12.04.2012 (7.562)	DESIGNED	
		CHECKED	
		APPROVED	
SHEET	SCALE	REVISION	

Drawing NO - 10

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