श्यामा प्रसाद मुखर्जी पोर्ट, कोलकाता
SYAMA PRASAD MOOKERJEE PORT, KOLKATA
Formerly Kolkata Port Trust

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
(Erstwhile KOLKATA PORT TRUST)
(AN AUTONOMOUS BODY UNDER THE MINISTRY OF PORTS, SHIPING AND WATERWAYS, GOVERNMENT OF INDIA)
KOLKATA DOCK SYSTEM

एन.एस. में बैक यार्ड के विकास सहित 7 एनएसडी पुराने बर्थ के पुनर्वास के लिए डिजाइन, इंजीनियरिंग और निर्माण। डॉक, केडीएस, एसएमपी, कोलकाता

"DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACK YARD AT N.S. DOCK, KDS, SMP, KOLKATA"

Tender Document for EPC Contract

NIT NO.SMPK/KDS/CIV/T/2622/60 Dt.29.10.2021

Civil Engineering Department
SYAMA PRASAD MOOKERJEE PORT, KOLKATA

FAX: +91–033-2230-0413, Phone: +91–033–2230-0413
Visit at www.smportkolkata.shipping.gov.in&https://kopt.enivida.in
Email:ce@kolkataporttrust.gov.in & sk.halder@kolkataporttrust.gov.in

Civil Engineering Department
SYAMA PRASAD MOOKERJEE PORT, KOLKATA

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PART A- GENERAL INFORMATIONS

1. Bid Description

NAME OF WORK: - "**DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK, KDS, SMP, KOLKATA**".

TENDER DOCUMENT AVAILABLE	FROM : TO :	02.11.2021, from 14:00 Hrs 09.12-2021, upto 13:00 Hrs
TIME AND DATE OF PRE-BID CONFERENCE(Online)	DATE :	16-11-2021
	TIME :	At 15:00 Hrs
LAST DATE AND TIME FOR RECEIPT OF BIDS	DATE :	09.12.2021
	TIME :	upto15:00 Hrs
TIME AND DATE OF OPENING OF BIDS	DATE :	10.12.2021
	TIME :	At 15:00 Hrs
PLACE OF OPENING OF BIDS :	Chief Engineer's Office, Kolkata Dock System, SMP,Kolkata. Head Office, 2nd FLOOR ,15 - Strand Road, Kolkata 700001	

2.NOTICE INVITING TENDERS (NIT)

ORGANISATION	SYAMA PRASAD MOOKERJEE PORT, KOLKATA
DEPARTMENT	Civil Engineering Department
NIT NUMBER	SMPK/KDS/CIV/T/2622/60 Dt.29.10.2021
NAME OF WORK	DESIGN, ENGINEERING & CONSTRUCTION FORREHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK, KDS, SMP, KOLKATA.(EPC contract)
PERIOD OF COMPLETION	18 (Eighteen) Months
FORM OF CONTRACT	EPC(TURNKEY)
BIDDING TYPE	Open Tender
TYPE OF TENDER	EPC Mode- Lump-sum turnkey
TENDER DOCUMENT FEE	Rs.10,000/-+Rs. 1,800/-(GST@18%) =Rs.11,800/- (Eleven Thousand Eight Hundred only)
RAILTEL TENDER PROCESSING FEE (NON-REFUNDABLE) MODE OF PAYMENT: - E-PAYMENT ONLY THROUGH DEBIT/CREDIT CARD OR NET BANKING.	Tender Processing Fee- Rs 7500/-+GST . Registration Charges Rs2000/-+ applicable GST .
TENDER DOCUMENT FEE PAYABLE TO	NEFT/RTGS to the Bank Account as detailed below: A/C: Syama Prasad Mookerjee Port, Kolkata A/c No: 067502000000491 IFSC: IOBA0000675 Bank Name: Indian Overseas Bank Branch Name: STRAND ROAD Branch
MODE OF PAYMENT	DD / NEFT/RTGS Payable to: Syama Prasad Mookerjee Port, Kolkata
SOLVENCY	Rs.30.60 Cr. All Bidders shall submit Bank Solvency certificate from a nationalized / scheduled bank in India for a minimum amount as mentioned in Section - III: Bid Data Sheet. The Bank Solvency certificate submitted by the Bidder shall not be older than one (1) year from the Bid Submission Last Date. In case Bidder does not adhere to this criterion, his bids shall be considered non-responsive and shall not be considered for further evaluation process.
EMD/BID SECURITY	Exempted as per Ministry of Finance Circular No. F9/4/2020-PPD, Dt.: 12-11-2020 upto 31.12.2021.
BID DOCUMENT DOWNLOADING START DATE & TIME	02.11.2021 from 14.00hrs.
PRE-BID MEETING	16.11.2021 at 15.00 hrs. in virtual mode (online). Link for Pre- Bid meeting : Link of Zoom Meeting https://zoom.us/j/92454810250?pwd=UFErRysvNFhEZmZCajVvRHZJTUxwdz09 Meeting ID : 92454810250 Pass Code: 741813
BID-DOCUMENT DOWNLOADING END DATE & TIME	09.12.2021 upto 13.00 hrs.

LAST DATE AND TIME FOR RECEIPT OF BIDS	09.12.2021 upto 15.00 hrs.
BID VALIDITY	180 days from the date of opening of tender.
TECHNICAL BID OPENING DATE & TIME	10.12.2021 after 15.00 hrs
OFFICER INVITING BIDS	Chief Engineer,KDS, SMP, Kolkata
BID OPENING AUTHORITY	Superintending Engineer-(Contract)
ADDRESS	C/o Chief Engineer's Office, Kolkata Dock System, SMP, Kolkata. Head Office, 2nd FLOOR ,15 - Strand Road, Kolkata 700 001
CONTACT DETAILS	• Designation- Chief Engineer: Mobile No.: +91 98362 98695 Email ID: ce@kolkataporttrust.gov.in • Designation-Dy. Chief Engineer – I: Mobile +91 98362 98651 Email ID: ab.pal@kolkataporttrust.gov.in • Designation-Dy. Chief Engineer – II: Mobile +91 98362 98680 Email ID: santanumitra@kolkataporttrust.gov.in • Designation -SE (Contract): Mobile No: +91 96747 20075 Email ID: sk.halder@kolkataporttrust.gov.in

3. Procedure for Bid Submission

Annexure-A

Important Instructions for e-Tender

Bidders are requested to use internet Browsers Firefox version below 50 / Internet Explorer version 8 or above, and Java 8Update 151 or 161.

Further, bidders are requested to go through the following information and instructions available on the Enivida Portal **https://kopt.enivida.in/** before responding to this e-tender:

- Bidders Manual Kit
- Help for Contractors
- FAQ

Contact Persons (Syama Prasad Mookerjee Port, Kolkata):

1. S.K. Halder, Superintending Engineer (Contract)
2. R. Mondal, Engineer(c) M.N.-9674720070

Phone no. **03371012486 ,03371012398**

e-mail ID: - sk.halder@kolkataporttrust.gov.in & cecontract@kolkataporttrust.gov.in

Contact persons (Enivida Portal):

Phone No.7278929467/8448288981

Mail id: - enividahelpdesk@gmail.com/ewizardkumar@gmail.com

1	All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.
2	E-tender cannot be accessed after the due date and time mentioned in NIT.
3	KoPT reserves the right to cancel or reject or accept or withdraw or extend the tender in full or part as the case may be without assigning any reason thereof.
4	Any order resulting from this tender shall be governed by the terms and conditions mentioned therein.
5	No deviation to the technical and commercial terms & conditions are allowed.
6	The bidders must upload all the documents required as per terms of tender. Any other document uploaded which is not required as per the terms of the tender shall not be considered.
7	The bid will be evaluated based on the filled-in technical & commercial formats.
8	Bidder has fully read and understood the entire Tender Document, GCC, Corrigendum and Addenda, if any downloaded from under the instant e-tender and no other source, and will comply to the said document, GCC, Corrigendum and Addenda. **A declaration in this regard is to be made by the bidder.**
9	(A) Tender will be opened electronically on specified date and time as mentioned in the NIT. Bidder's can witness electronic opening of Bid. (B) Necessary addendum/corrigendum (if any) of the tender would only be hoisted in the e-Enivida Portal
10	(A) Part- I i.e. Techno-commercial Bid will be opened electronically on specified date and time as mentioned in the NIT. Bidders can witness electronic opening of Bid. (B) Part- II i.e Price Bid will be opened electronically of only those bidder (s) whose offer will be Techno-Commercially qualified and accepted by SMPK. Such Bidder (s) will be intimated the date of opening of price Bid (Part II) in due course through valid email confirmed by them. Necessary Addendum/ Corrigendum (If Any) of the tender would only be hoisted in the Enivida Potal.

a. Bids shall be submitted online on Enivida Portal **https://kopt.enivida.in**

b. The bidders should scan and upload copies of Document in support of Registration as contractor. The bidders shall manually sign on all the documents, uploaded by him, owning responsibility for their correctness/authenticity.

c. (1) The bidders should pay the Tender Document Fee (non-refundable) which shall be accepted only through RTGS/NEFT/Electronic Bank Transfer. The SMPK bank account details to which amount is to be transferred on is given below:

A/C: Syama Prasad Mookerjee Port, Kolkata
A/c No: 067502000000491
IFSC: IOBA0000675
Bank Name: Indian Overseas Bank
Branch Name: STRAND ROAD Branch

(2) The Ministry of Finance Guide lines issue vide OM no. F.9/4/2020-PPD, dt.12.11.2020 regarding Bid Security/Earnest Money Deposit/Performance Guarantee/Security Deposit instructions will be applicable for all the tenders till 31.12.2021.

(3) The bidders those who are claiming EMD Exemption as per Ministry of Finance Guidelines No.F.9/4/2020-PPD dt 12-11-2020, are advised to submit "Bid Security Declaration" towards EMD and same should be submitted along with technical bid failing which the bid shall be summarily rejected.

(4) The bidders shall upload the copy of the online transaction details with UTR No. along with the Technical bid documents failing which the bid shall be summarily rejected. SMPK shall not be liable/responsible for any connectivity/internet problem either with user side /NIC/Bank. It is in the own interest of the bidders, bidders may get it verified from Bank that there requisite money has been received by SMPK for the said NIT.

(5) In case of the NSIC/MSME certificate submitted bidders, the eligibility for exemption of Transaction fee and EMD amount subject to fulfilling of tender conditions.

d. The SMPK will not hold any risk and responsibility non-visibility of the scanned and uploaded documents.

e. The Documents that are uploaded online on the Enivida Portal **https://kopt.enivida.in/**will only be considered for Bid Evaluation.

3. <u>General Terms and Conditions</u>

Tender fee: All the participating bidders shall pay a tender document fee (non-refundable) in on-Line transaction for **Rs.10,000/-+Rs. 1,800/-(GST@18%) = Rs.11,800/- (Eleven Thousand Eight Hundred only)** (accepted only online payable through DD / RTGS/NEFT/Electronic Bank Transfer) to be transferred on:

A/C: Syama Prasad Mookerjee Port, Kolkata
A/c No: 067502000000491
IFSC: IOBA0000675
Bank Name Indian Overseas Bank
Branch Name: STRAND ROAD Branch

a. E.M.D. is exempted now as per Ministry of Finance **Circular No.F.9/4/2020-PPD, dt.12.11.2020,which is valid upto 31.12.2021.**

b. Only e-tender will be accepted & any other method for accepting the tender will not be entertained.

c. "The bidder shall authenticate the bid with his digital signature certificate for submitting the bid electronically the Enivida Portal**https://kopt.enivida.in/**platform and the bids not authenticated by digital signature certificate of the bidder will not be accepted on the e-procurement platform."

d. The successful bidder found defaulting in submission of hard copies of uploaded certificates /documents, within the stipulated time i.e. before concluding the agreement or if any variation is noticed between the uploaded documents and the hard copies submitted by the successful bidder, the successful bidder will be suspended from participating in tenders on the Enivida Portal platform for a period of three years**.**

4. Even though the Tenderers meet the qualifying criteria, they are liable to be disqualified /debarred / suspended/blacklisted if they have
   - furnished false / fabricated particulars forms, statements and annexure, submitted in proof of the qualification in the requirements and/or
   - Not turned up for entering into agreement, when called upon.
   - Record of poor progress such as abandoning the work, not properly completing the contract, in ordinate delays in completion, litigation history or financial failures etc. and/or
   - Participated in the previous bidding for the same work and had quoted unreasonably high lump-sum price and
5. Even while execution of the work, if found that the work was awarded to the Contractor based on false / fake certificates of experience, litigation, action pending or any other reason whatsoever attracts disqualification at the discretion of the competent authority and work will be terminated immediately. If the offered price quoted by a tenderer is found to be either abnormally high or with in the permissible ceiling limits prescribed but under collusion or due to unethical practices adopted at the time of bidding process, such bids shall be rejected.
6. A tenderer / Bidder submitting a Tender or Bid which the tender accepting authority consider successive and or indicative of insufficient knowledge of current prices or definite attempt of profiteering will render himself liable to be debarred permanently from tendering or for such period as the tender accepting authority may decide. The tenderer overall price should be based on the controlled prices for the materials, if any, fixed by the SMPK or the reasonable prices permissible for the tenderer to charge a private purchaser under the provisions of clause-6 of the hoarding and profiteering prevention ordinance of 1943 as amended from time to time and on similar principle in regard to labour supervision on the construction.

7. One Tender per Tenderer:

Each Tenderer shall submit only one Tender for the work. A Tenderer who submits more than one Tender will cause dis-qualification for all the tenders submitted by them.

8. Last date/time for Submission of the Tenders.

a. Tenders must be submitted not later than the date and time specified in NIT. In the event of the specified date / time for the submission of bids declared as holiday, the bids will be received on the next working day.

b. The Chief Engineer,KDS, SMPK, may extend the dates for issue and receipt of Tenders by issuing an amendment at the sole discretion of SMPK.

9. Modification to the Tender.

No Tender can be modified after the last date/time of submission of Tenders.

TENDER OPENING AND EVALUATION:

10. Tender opening:

a) The tenderers or their authorised representatives can be present at the time of opening of the tenders. Either the tenderer himself or one of his representatives with proper authorization only will be allowed at the time of tender opening. If any of the tenderer is not present at the time of opening of tenders, the tender opening authority will, on opening the tender of the absentee tenderer, reads out and record the deficiencies if any, which shall be binding on the tenderer.

b) The technical bid containing qualification requirements will be evaluated by the tender opening authority and the minutes are recorded which will be signed by the tender opening authority .

11. Clarification on the Technical Bid:

a) The tender opening authority may call upon any Tenderer/Bidder for clarification on the statements, documentary proof relating to the technical bid. The request for clarification and response there to shall be in writing and it shall be only on the qualification information furnished by the Tenderer. The clarification called for from the tenderers / Bidders shall be furnished within the stipulated time, which shall not be more than a week.

b) The Tenderer/Bidder are bound to furnish clarifications called for by SMPK Authority within the stipulated time otherwise disqualification and rejection of his tender in the event of failure to do so.

12. Price Bid Opening:

a) Only the Price Bids of qualified Tenderers whose technical Bids are found satisfying the eligibility criteria shall be opened in the presence of the qualified Tenderers / Bidders who ever is interested or their authorized representatives present on the date and time fixed for opening of Price bid.

b) The Price Bid of the Unqualified Tenderers will not be opened.

c) Tenders shall be scrutinized in accordance with the conditions stipulated in the Tender document. In case of any discrepancy of non-adherence to the Conditions, the decision taken by the Tender Accepting Authority on tenders shall be final and the same shall be binding on Tenderer/ Bidder.

13. Evaluation and Comparison of Price Bids

The tender committee will evaluate and compare the price-bids of all the qualified Tenderers.

14. Process to be Confidential.

a) Information relating to the examination, clarification, evaluation and comparison of Tenders and recommendations for the award of a contract shall not be disclosed to Tenderers or any-other persons not officially concerned with such process until the award to the successful Tenderer has been announced by the tender accepting authority. Any effort by a Tenderer to influence the processing of Tenders or award decisions may result in the rejection of his Tender.

b) No Tenderer/Bidder shall contact the Superintending Engineer/Executive Engineer or any individual or authority concerned with finalization of tenders on any matter relating to tender from the time of the Tender opening upto the time the Contract is awarded.

c) Before recommending/accepting the tender, the tender recommending/accepting authority shall verify the correctness of certificates submitted to meet the eligibility criteria both commercial & technical. The authenticated agreements of previous works executed by the lowest tenderer may be called for.

d) Tenders will be finalized by the tender committee of SMP, Kolkata according to the powers vested with them.

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

Civil Engineering Department

NOTICE INVITING TENDERS

The Chief Engineer, **SYAMA PRASAD MOOKERJEE PORT, KOLKATA, Civil Engineering Department** invites tender for "**DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK, KDS, SMP, KOLKATA" [EPC**] (**two bid system)** based on tenderer's own survey, detailed sub soil investigations, detailed design, as per scheme indicated and the minimum requirements conforming to those indicated in bid documents; having sound experience of similar kind of construction work given below from the eligible firms

Name of work	Works to be Carried out	EMD	Time Allowed For Completion
DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK; KDS; SMP, KOLKATA	**ENGINEERING, PROCUREMENT & CONSTRUCTION of OLD BERTH NO.7,NSD ON TURN-KEY BASIS.** (as per Scope of Work)	**Exempted as per Ministry of Finance Circular No. F9/4/2020-PPD, dt.: 12-11-2020 which is upto 31.12.2021.** (Bid security Declaration Should be Submitted in Form D-2)	**18 Months**

1. Lump-sum price tenders are invited for the work "**DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK; KDS; SMP, KOLKATA**".

2. **Tender fee:** All the participating bidders shall pay a tender fee (non-refundable) in on-Line transaction for **Rs.10,000/-+Rs. 1,800/-(GST@18%) =Rs.11,800/- (Eleven Thousand Eight Hundred only)** (accepted only online payable through DD / RTGS / NEFT / Bank Transfer etc.,) to be transferred on
   A/C: Syama Prasad Mookerjee Port, Kolkata
   A/c No: 067502000000491
   IFSC: IOBA0000675
   Bank Name Indian Overseas Bank
   Branch Name: STRAND ROAD Branch

3. The time allowed for completion of the work will be 18 MONTHS.

4. Earnest money is presently exempted as per Ministry of Finance Circular No. F9/4/2020-PPD, Dt.: 12-11-2020 upto 31.12.2021.

5. The contractor whose tender is accepted will be required to furnish Security Deposit for due fulfillment of this contract consisting of a percentage deduction from the R/A bills to be made on account to the contractor. The Earnest Money will be treated as part of the security deposit of work.

6. The acceptance of tender will rest with the BoT, **SYAMA PRASAD MOOKERJEE PORT, KOLKATA,** which does not bind itself to accept lowest tender and reserves the authority to reject any or all the tenders received without assigning any reason. All tenders in which any of the prescribed condition is not fulfilled will be rejected.

7. Tenders which do not fulfill all or any of the above conditions and or incomplete in any respect are liable to be summary rejected and tenders containing uncalled for remarks or any additional conditions are also liable to be summarily rejected.

8. Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the contractors, who resort to canvassing will be liable to rejection.

   (a) The amount shall be quoted in figures and words and shall be accurately filled in.

   (b) In case of any discrepancy between words and figures, price in words shall be reckoned.

9. GST will be paid by SMP,Kolkata as per actual.

10. The tenderer will have to give a certificate that he is not related to any officer of Syama Prasad Mookerjee Port, Kolkata or any Officer in the rank of under Secretary or above in the Ministry of Ports, Shipping and Waterways (MoPSW), Government of India. The tenderer should give a declaration in this regard

11. No Engineer of Gazetted Rank or other Gazetted Officer employed in Engineering or administrative duties in an Engineering Department of Government of India is allowed to work as a Contractor for a period of 2 years of his retirement from Government of India. This contract is liable to be cancelled if either the Contractor or any of his employee is found at any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the Contractor's service as the case maybe.

12. Site for the execution of the work will be made available as soon as the work is awarded. In case it is not possible for the department to make available the entire site at a time on the award of the work, the Contractor will have to arrange their working programme suitably. No claim what so ever for handing over the site in stages will be entertained, and the decision of the Chief Engineer is final and cannot be questioned.

13. The Contractor shall produce a license in the prescribed form from Asst. Labour Commissioner (Central), within15 days from the date of work order and on his failure to do so the contract is liable to be terminated and the Earnest Money Deposit or Security Deposit whichever is to his credit shall be forfeited and the Contract shall have no claim what so ever on this account.

14. The Tender submitted by the tenderer should be valid for a minimum period of 180 days from the date of opening of tender and the tenderer cannot amend, alter or revoke his tender in any way during this period.

15. The successful tenderer shall execute an agreement with Board of Trustees of **SYAMA PRASAD MOOKERJEE PORT, KOLKATA** on a Non-judicial stamp paper worth of Rs.100/-in the prescribed form.

16. The tenderers should acquaint themselves with the work and working conditions of the site and locality and no claim will be entertained on this issue and the decision of Chief Engineer is final and cannot be questioned.

17. a) According to GST Act every dealer is liable to be registered whose aggregate turn over exceeds Rs.**20.00** lakhs for supply of Goods/ service/ executing any works contractor. Accordingly, GSTIN is to be provided for participation to tender and to award the contract.

    (b)The applicable ATDS as per the contract GST/CGST Act, will be deducted as and when notified by the Government.

18. The tenderer should visit the site/ read the specifications and study the working drawing and special conditions etc., carefully before submitting the tender.

19. P.F. contribution to the contract labour, in case the Contractor engages more than 20 workers, shall be payable by the Contractor. He shall produce documentary proof of registration with P.F. Authorities along with P.F. Code number. Also documentary proof of payment of P.F. contribution to the Contract Labour Regularly shall be produced with every interim certificate failing which no payment will be released to the Contractor. The Port Trust will not entertain any claim whatsoever in this respect.

20. Payment to the contract labour if any involved in the works entrusted are to be paid by the Contractor in the presence of the site officer of SMP, Kolkata as per prevailing M.W.Act. Further, the Contractor has to submit documentary evidence in support of the payments made to the labour engaged in the work along with subsequent running account bill, failing which the bill will not be passed.

21. In respect of P.F. Contribution recovered from the labour and remitted to the P.F. Commissioner, documentary evidence in support of the same is to be submitted by the Contractor along with subsequent running account bill, failing which the bill will not be passed.

22. The Contractor to whom the work is awarded shall invariably produce the PAN Number obtained from the Income Tax Authorities, along with proof.

23. The contractor shall submit require document as per the Check list enclosed along with tenders. The tenders received without enclosing required documents as per the checklist duly signed will be liable for rejection.

24. The contractors / Firms while quoting tender shall note that, post tender negotiations may be held with the L-1 bidder, if necessary.

25. In the event that two or more Bidders quote the same amount (The "Tie Bids"), the authority shall identify the selected Bidder by further dropping in close sealed cover, which shall be conducted, with prior notice, and opened in presence of the Tie Bidders who choose to attend.
26. Tenderer shall submit the experience/completion certificates of works along with their tender.
27. In case the documents submitted by the bidder found to be not genuine, the management reserves the right to not to allow to participate in future tenders of SMPK.
28. The rate to be quoted should be exclusive of GST component and payment will be made against "Tax Invoice" as prescribed under the GST Act/Rules.
29. Income Tax as applicable will be deducted from all running bills..
30. The successful bidder is required to remit GST as per the "Tax Invoice" and file the details in GSTRI on or before 10th of the subsequent month to enable SMPK to claim in put tax credit otherwise the said tax invoice will be kept pending for payment.

INSTRUCTIONS TO BIDDERS FOR ONLINE e-BID SUBMISSION THROUGH

e-TENDERING and e-PROCUREMENT:

The **SYAMA PRASAD MOOKERJEE PORT, KOLKATA**(SMPK) has migrated from manual tendering toe-procurement and e-tendering system using the software of NIC for this purpose.

PROCEDURE FOR SUBMISSION OF TENDER

The bidders are required to submit soft copies of their bid electronically on the Railtel Portal using valid Digital Signature Certificates. Below mentioned instructions are meant to guide the bidders for registration on the Railtel enivida Portal, prepare their bids in accordance with the requirements and submit their bids online on the Railtel Portal. For more information, bidders may visit the Railtel Portal **https://kopt.enivida.in**

1. REGISTRATION PROCESS ON ONLINE PORTAL

a. Bidders to enroll on the e-Procurement module of the portal **https://kopt.enivida.in** by clicking on the link "Bidder Enrolment" as per portal norms.
b. The bidders to choose a unique username and assign a password for their accounts. Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the Railtel enivida Portal.
c. Bidders must provide the details of PAN number, registration details etc. as applicable and submit the related documents. The user id will be activated only after submission of complete details. The activation process will take minimum 24 working hours. After completion of registration payment, you can also send your acknowledgement copy on our help desk mail id **enividahelpdesk@gmail.com** for activation of your account.
d.

Railtel Registration Charges: **Mode of Payment**: E-payment Only through Debit/ Credit Card or Net Banking.	Registration Charges: Rs.2000/- + applicable GST

e. Bidders to register upon enrolment their valid Digital Signature Certificate (DSC: Class III Certificates with signing key and encryption usage) issued by any Certifying Authority recognized by CCA India with their profile.
f. A bidder should register only one valid DSC. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others, which may lead to misuse. Foreign bidders are advised to refer "DSC details for Foreign Bidders" for Digital Signature requirements on the portal.
g. Bidder then logs in to the site through the secured login by entering their user ID/password and the password of the DSC / e-Token.

2. Tender Document Search

a. Various built-in options are available in the Railtel enivida Portal to facilitate bidders to search active tenders by several parameters. These parameters include Tender ID, organization, location, date, value, etc.
b. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, a form of contract, location, date, other keywords, etc. to search for a tender published on the Online Portal.
c. Once the bidders have selected the tenders they are interested in, they may download the required documents/tender schedules. These tenders can be moved to the respective '**Interested Tenders**' folder. This would enable the Online Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.
d. The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification/help from the Helpdesk.

3. Bid Preparation

a. Bidder should also take into account of corrigendum published on the tender document and attach them with original tender document during submitting their bids.
b. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid.

c. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that needs to be submitted. Any deviations from these may lead to rejection of the bid.
d. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document/schedule and generally, they can be in PDF/XLS/PNG, etc. formats. Documents in PDF format with maximum Five (5) Mb file can be uploaded.

4. Bid Submission

a. Bidder to log into the site well in advance for bid submission so that he/she uploads the bid in time i.e., on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
b. The bidder to digitally sign and upload the required bid documents one by one as indicated in the tender document.
c. Bidders must pay required payments (Form fee, EMD, Tender Processing Fee etc.) as mentioned before submitting the bid.
d. Bidder to select the payment option mode as specified in the Schedule (EMD/FORM FEE Section) to pay the form fee/ EMD wherever applicable and enter details of the instrument.
e.

Railtel Tender Processing Fee: (Non-refundable) **Mode of Payment**: E-payment Only through Debit/ Credit Card or Net Banking.	TPF- 0.1% of estimate cost (Rs7500/-) + GST Registration Charges ₹2000/- +applicable GST.

f. A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders to note that they should necessarily submit their financial bids in the prescribed format and no other format is acceptable.
g. The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, the opening of bids, etc. The bidders should follow this time during bid submission.
h. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data, which cannot be viewed by unauthorized persons until the time of bid opening.
i. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
j. Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.
k. Kindly have all relevant documents in a single PDF file.
l. The off-line tender shall not be accepted and no request in this regard will be entertained whatsoever.

5. Amendment of bid document

At any time prior to the deadline for submission of proposals, SMPK reserve the right to add/ modify/ delete any portion of this document by the issuance of a Corrigendum, which would be published on the website and will also be made available to the all the Bidder who have been downloaded the tender document. The Corrigendum shall be binding on all bidders and will form part of the bid documents.

6. Instruction to Bidders

a. Process for Bid submission through Railtel enivida portal is explained in Bidder Manual. Bidders are requested to download Bidder Manual from the home page of website (**https://kopt.enivida.in**). Steps are as follows:

(Home page ⟹ Downloads ⟹ Bidder Manuals).

b. The tenders will be received online through portal **https://kopt.enivida.in**. In the Technical Bids, the bidders are required to upload all the documents in .pdf format.
c. Possession of Valid Class III **Digital Signature Certificate (DSC)** in the form of smart card/ e-Token in the company's name is a prerequisite for registration and participating in the bid submission activities through

https://kopt.enivida.in. Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available on the web site https://kopt.enivida.in under the link 'DSC help'.

Tenderers are advised to follow the instructions provided in the `User Guide and FAQ' for the e-Submission of the bids online through the Railtel Portal for e-Procurement at https://kopt.enivida.in

d. The bidder has to "**Request the tender**" to portal before the "**Date for Request tender document**", to participate in bid submission.

7. All entries in the tender should be entered in online Technical & Commercial Formats without any ambiguity.

8. Any order resulting from this e-tender shall be governed by the terms and conditions mentioned therein.

9. No deviation to the technical and commercial terms & conditions will be allowed.

10. The tender inviting authority has the right to cancel this e-tender or extend the due date of submission of the bids.

11. The confidentiality of the bids is maintained since these cured Socket Layer **12B bit** encryption technology is used. Data storage encryption of sensitive fields is done.

12. The bidder should logout of the tendering system using the normal log out option available at the top right-hand corner and not by selecting the (X) option in the browser.

13. Bidder can re-submit the bid as many times as possible within the Bid-Submission end date and time.

14. Bidder can withdraw the bid submitted online within the bid submission end date and time, and the withdrawn bid can't be resubmitted.

15. For any clarifications on in the https://kopt.enivida.in. please contact **SYAMA PRASAD MOOKERJEE PORT, KOLKATA**.

CONTACT DETAILS

Land Line Number: +91–033–2230-0413

Mobile Number

1. Chief Engineer : +91 98362 98695
2. Dy. Chief Engineer – I: +91 98362 98651
3. Dy. Chief Engineer –II: +91 98362 98680
4. SE (Contract): +91 96747 20075

4. MEMORANDUM (GENERAL DESCRIPTION)

…

LUMP-SUM PRICE -TENDER FOR WORKS

I/ We hereby tender for execution for Board of Trustees of the **SYAMA PRASAD MOOKERJEE PORT** of the works specified in the tender memorandum within the time specified in such memorandum at the rates specified there in and in accordance in all respects with the specifications design and instructions in writing referred to the conditions of contract and with such materials as are provided in all other respects in accordance with such conditions so far as applicable.

MEMORANDUM (GENERAL DESCRIPTION)

a)	Name of work	:	**"DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK, KDS, SMP, KOLKATA"**
b)	Earnest Money	:	**EXEMPTED now upto 31.12.2021 as per Ministry of Finance Circular No. F9/4/2020-PPD, Dt.: 12-11-2020.**
c)	Security Deposit	:	
	i) Retention Money(S.D)		As per provision in GCC as per GCC Clause 3.4 (f), (g), (h) & (i).
	ii) Performance Guarantee	:	3 % of the Contract amount to be paid within 21 days of issuance of work order as per Ministry of Finance Circular No. F9/4/2020-PPD, Dt.: 12-11-2020. VALID UPTO 31.12.2021
e)	Percentage to be deducted from bills towards Retention Money	:	As per provision in GCC
f)	Time allowed for the work from date of written order to commence.	:	**18** (Eighteen) Months
g)	Period of commencement	:	15 (Fifteen) days from the date of issue of Work Order/LOI.
h)	Defect Liability Period: /Period of maintenance	:	10 (Ten) years from the date of completion.

Should this tender be accepted, I/We here by agree to abide by and fulfill all the terms and provisions of the conditions contained in the pamphlet named "GENERAL AND SPECIAL CONDITIONS OF CONTRACT" which have been read by me, read and explained to me so far as applicable, or in default thereof to forfeit and pay to the Board of Trustees or its successors in office the sums of money mentioned in the said conditions:

Give particulars and Nos. strike out
(a) If no cash security deposit is to be taken

EMD/BID SECURITY amount Exempted, as per Ministry of Finance circular no. F.9/4/2020-PPD, dt.12.11.2020

Strike out(b) if any Cash Security Deposit is taken _____

Receipt attached as Earnest Money
(A) the _____

Signature of bidder before submission Dated the_____day of_____2021 of tender.

Signature of witness

Witness:

Address:
Occupation:

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PART B- COMMERCIAL BID

SECTION -1

INSTRUCTIONS TO BIDDERS

GENERAL:

1 Scope of Bid

The Chief Engineer SMPK invites bids on EPC mode for the construction of "DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S.DOCK, KDS, SMP, KOLKATA" detailed in the table given in NIT. The bidders may submit bids for the works detailed in the table given in NIT.

The successful bidder will be expected to complete the works by the intended completion date specified in the Contract data.

2 Eligible Bidders

2.1 The Invitation for Bid is open to all eligible bidders meeting the eligibility criteria as defined in clause no.3.

2.2 All bidders shall provide in Section 2, Forms of Bid and Qualification Information, a statement that the Bidder is not associated, nor has been associated in the past, directly or indirectly, with the Consultant or any other entity that has prepared the design report, specifications, and other documents for the SMPK for this tender. A firm that has been engaged by the Employer to provide consulting services for the preparation of tender / supervision of the works/PMC and any of its affiliates shall not be eligible to bid.

2.3 Government-owned enterprises may only participate if they are legally and financially autonomous, operate under commercial law and are not a dependent agency of the Employer subject to fulfilment of Minimum Qualifying Criteria.

2.4 Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the employer in accordance with clause 34.

3. Eligibility Criteria

3.1

3.1.1 Experience on similar works executed successfully during the last seven years and details like monetary value, client's satisfaction & proof of satisfactory completion certificate from client.

3.1.2 Documentary evidence of adequate financial standing and proof from client for satisfactory completion of works.

3.1.3 Solvency certificate from Bankers for Rs.30.60 Cr.

3.1.4 Equipment requirement/schedule.

3.1.5 Managerial/Manpower requirement.

3.1.6 Project Planning and Quality Control procedure to be adopted. Information regarding projects in hand, current litigation, orders regarding exclusion, expulsion or black listing, if any.

3.1.7 Trained Technical & Certified workmen proposed to be employed at the work site of the project. The Contractor must undertake to employ of certified technical worker to the extent of 20% of total strength. Valid certificates by a recognized University, technical Board or Ministry, Government of India would only be taken cognizance of.

3.2 Design satisfying the project requirement as certified by PMC, all bidders shall include the following information and documents with their bids in Section 2.

3.2.1 Copies of original documents defining the constitution or legal status, place of registration, and principal place of business;

3.2.2 written power of attorney of the signatory of the Bid to commit the Bidder;

3.2.3 Total monetary value of each construction work performed during last seven years;

3.2.4 Experience in works of a similar nature and size for each of the last seven years and details of works underway or contractually committed; and

3.2.5 Employers who may be contacted for further information on those contracts;

3.2.6 Major items of construction equipment proposed to carry out the Contract;

3.2.7 Qualifications and experience of key site management and technical personnel proposed for the Contract;

3.2.8 Reports on the financial standing of the Bidder, such as profit and loss statements and auditor's reports for the past seven years;

3.2.9 Evidence of adequacy of working capital for this contract (access to line(s) of credit and availability of other financial resources)
Authority to seek references from the Bidder's bankers;

3.2.10 Information regarding any litigation, current or during the last seven years, in which the Bidder is involved, the parties concerned, and disputed amount;

3.2.11 Proposals for subcontracting components of the Works amounting to more than 10 percent of the Bid Price (for each, the qualifications and experience of the identified sub-contractor in the relevant field should be annexed); and

3.2.12 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.
Designs to be submitted for approval of PMC/Client.

3.3 To qualify for the contract, bidders are advised to note the minimum qualification criteria specified below.

(i)Details of average annual turnover shall not be less than Rs.22.94 Crores during the last 3(three) years ending 31st March of the previous financial year duly certified by the Charted Accountant verified with UDIN.

(ii) Proof of experience in similar nature of works i.e., experience of having successfully completed works as defined in the Tender Document during last 7 years ending last day of month previous to the one in which applications are invited should be

a. 3 (three) completed works of each costing not less than the amount equal to Rs. 30.59 Crores.

(or)

b. 2(two) completed works of each costing not less than Rs. 38.24 Crores.

(or)

c. 1(one) completed work of each costing not less than Rs.61.18 Crores.

Similar Works: Infrastructure works related to Construction of Jetty / berth / wharves or Construction of heavy industrial building or Construction of water retaining structure like dam, anicut structure or Construction of RCC bridges. All these works must be carried out involving RCC & pile/sheet pile works.

3.4 Sub-contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria.

3.5 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

- Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

- Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.

-

4. One Bid Per Bidder

Each bidder shall submit only one bid . A bidder who submits more than one Bid to be disqualified.

<u>Joint Venture:</u>

Joint venture partners would be limited to three (including the lead partner) with at least 26% equity holding for each member. One of the partners, who is responsible for performing key function in the contract management or is executing major component of the proposed contract, shall be nominated as being in charge during the bidding period and in the event of a successful bid, during contract execution. The partner in charge shall be authorised to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture, this authorization shall be evidenced by submitting registered power of attorney signed by legally authorized signatories of all the partners.

All partners of the joint venture shall be liable, jointly and severally during the bidding process and

for the execution of the contract in accordance with contract terms and a statement to this effect shall be included in the authorization as above. The bid shall be signed so as to legally bind all partners, jointly and severally.

The joint venture must satisfy collectively the eligibility criteria as described in this section. For this purpose, the following information of each member of the joint venture may be added together to meet the collective eligibility criteria:

Joint ventures must comply with the following requirements:

a. Average Annual Turnover
b. Particular Construction Experience
c. Capacity of key Personnel
d. Ability to own/lease relevant equipment
e. Financial capacity

Each JV partner including the lead partner shall meet not less than 26% of the following criteria:

i) Average Annual Turnover
ii) Particular Construction Experience
iii) Financial capacity

All the partners together shall satisfy 100% of the criteria.

A copy of the joint venture agreement (JVA) specific to this project, if entered into by the partners shall be submitted with the Bid. Alternatively, a letter of intent to execute a JVA in the event of successful bid shall be signed by all partners and submitted with the bid. In any case, it is mandatory that a JV agreement is entered into before award of the work.

Pursuant to the foregoing, the JVA shall include among other things, the joint-venture's objectives, the proposed management structure, the contribution of each partner to joint-venture operation, the commitment of the partners to joint and several liability for due performance, recourse / sanctions with in the joint venture in the event of default or withdrawal of any partner and arrangements for providing the required indemnities.

4.1 JOINT VENTURES / CONSORTIUM AND OTHER FORMS OF ASSOCIATION

In case the tender is submitted in joint venture/consortium, the Bidder shall submit the following confirmation along with their offer submitted with this tender.

4.1.1 All joint venture agreements / consortium agreements, technical collaboration agreement shall ensure that all parties of the joint venture/consortium are individually and jointly responsible for the tender conditions and such agreements are legally valid.

4.1.2 Joint venture/consortium should be in the nature of legally acceptable agreements and such agreements should be notarized.

4.1.3 Such joint venture/consortium agreement should contain explicitly the scope and responsibilities of all the partners in the joint venture/consortium in terms of financial and technical commitments/contribution. The JV/consortium should be equally, severally and jointly responsible.

4.1.4 One of the members of the consortium shall be authorized as being in-charge (lead member), and this authorization shall be evidenced by a power of attorney duly signed by the authorized signatories of the consortium Members as per the format enclosed in the tender document as per Format provided in Section -6 of this tender document.

4.1.5 The validity of the joint venture/consortium agreement entered upon on the award of Letter of Acceptance (LOA) by SYAMA PRASAD MOOKERJEE PORT, KOLKATA should continue for the entire period of contract as specified in the tender. All such agreements shall be irrevocable for the above periods.

4.1.6 Firms with at least 26% equity holding each shall be allowed to jointly meet the eligibility criteria.

4.1.7 Where the bidder is a consortium the average annual financial turnover of the individual members forming the consortium shall be submitted.

4.1.8 The entity processing the tender must be a member of the consortium submitting the tender.

4.1.9 It is clarified that an unsuccessful bidder or JV/Consortium shall not be permitted to join a successful JV/Consortium whose bid is accepted at a later date.

4.1.10 In case of a Consortium, the combined Technical and Financial Capability of those members who have and shall have share of at least 26% (twenty-six per cent) each, should satisfy the above conditions of eligibility, provided that each such member shall, for the entire period of the contract, hold share not less than 26%.

4.2 FURTHER CONDITIONS FOR JV/CONSORTIUM:

4.2.1 Intending tenderer(s), as Consortium, is eligible to participate in the tender. The term "Tenderer" used in this document would apply to either a Single Entity or a group of entities, i.e. a Consortium. Further, the Tenderer may be a natural person, private entity, government owned entity or any combination of them with a formal intent to enter into an agreement or under an existing agreement to form a Consortium. A Consortium shall be eligible for consideration subject to the conditions set out in this tender document.

4.2.2 The Tenderer shall not have a conflict of interest that affects the Tendering Process. Any Tenderer found to have a Conflict of Interest shall be disqualified. A Tenderer shall be deemed to have a Conflict of Interest affecting the Tendering Process, if:

4.2.3

The Tenderer, its Member or Associate (or any constituent thereof) and any other Tenderer, its Member or any Associate thereof (or any constituent thereof) have common controlling shareholders or other ownership interest; provided that this disqualification shall not apply in cases where the direct or indirect shareholding of a Tenderer, its Member or an Associate thereof (or any shareholder thereof having a shareholding of more than 5 per cent of the paid up and subscribed share capital of such Tenderer, its Member or Associate, as the case may be) in the other Tenderer, its Member or Associate is less than 5 per cent of the subscribed and paid up equity share capital thereof; provided further that this disqualification shall not apply to any ownership by a bank, insurance company, pension fund or a public financial institution referred to in section 4A of the Companies Act 1956, or any of its subsequent amendment. For the purposes of this Clause, indirect shareholding held through one or more intermediate persons shall be computed as follows:

4.2.4 Where any intermediary is controlled by a person through management control or otherwise, the entire shareholding held by such controlled intermediary in any other person (the "Subject Person") shall be taken into account for computing the shareholding of such controlling person in the Subject Person; and

4.2.5 Subject always to sub-clause iii(Financial Bid) above, where a person does not exercise control over an intermediary, which has shareholding in the Subject Person, the computation of indirect shareholding of such person in the Subject Person shall be undertaken on a proportionate basis ; provided, however, that no such shareholding shall be reckoned under this sub-clause.

4.2.6 If the shareholding of such person in the intermediary is less than 26% of the subscribed and paid up equity shareholding of such intermediary;

OR

4.2.7 A constituent of such Tenderer is also a constituent of another Tenderer;

OR

4.2.8 Such Tenderer, or any Associate thereof receives or has received any direct or indirect subsidy, grant, concessional loan or subordinated debt from any other Tenderer, or any Associate thereof or has provided any such subsidy, grant, concessional loan or subordinated debt to any other Tenderer, its Member or any Associate there of;

OR

4.2.9 Such Tenderer has the same legal representative for purposes of this Tender as any other Tenderer;

OR

4.2.10 Such Tenderer, or any Associate thereof has a relationship with another Tenderer, or any Associate thereof, directly or through common third party/parties, that puts either or both of them in a position to have access to each others' information about, or to influence the Tender of either or each other.

4.2.11 A Tenderer shall be liable for disqualification if any legal, financial or technical adviser of SYAMA PRASAD MOOKERJEE PORT, KOLKATA in relation to the Tender is engaged by the Tenderer, its Member or any Associate thereof, as the case may be, in any manner for matters related to or incidental to the Tender. For the avoidance of doubt, this disqualification shall not apply where such adviser was engaged by the Tenderer, its Member or Associate in the past but its assignment expired or was terminated 6 (six) months prior to the date of issue of this Tender. Nor will this disqualification apply where such adviser is engaged after a period of 3 (three) years from the date of commercial operation of the contract.

Explanation: In case a Tenderer is a Consortium, then the term Tenderer, as used above, shall include each Member of such Consortium.

Note: Notwithstanding anything to the contrary contained in this tender document, in the event of any member of any Consortium suffering from a Conflict of Interest, the offer of such consortium shall be treated as disqualified. However, in the event of similar situation arising / detected after placement of LOI, the same shall have to be addressed and resolved by the Consortium, failing which the contract, if entered into, shall be terminated.

In this regard, it must be borne in mind that suppression of such Conflict of Interest, if detected later, shall not absolve the Consortium of its responsibility and appropriate action shall be initiated in terms of the provision of the tender.

The Tenderer(s) shall have valid documents as listed in various clauses of this tender document and submit the same in the manner as stipulated.

5. Cost of Bidding

The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

6. Site Visit

The Bidder, at their own responsibility and risk is encouraged to visit and examine the Site of works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for execution of the Work. The costs of visiting the site shall be at the Bidders' own expense.

BIDDING DOCUMENTS

7. Content of Bidding Documents

As per Index of Tender Document.

The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, technical specifications, forms, drawings, annexures in the bid document. Failure to comply with the requirements of the bid document shall be at the bidder's own risk. Pursuant to clause 26 of Section-1 hereof, bids which are not substantially responsive to the requirements of the bid documents shall be rejected.

8. Clarification of Bidding Documents

A prospective bidder requiring any clarification of the bidding documents may notify the employer in writing or by electronic form at least one day advance before pre-bid meeting date.

Pre-bid meeting

The bidder or his official representative is invited to attend a pre-bid meeting in virtual mode (online), which will take place at The Chief Engineer's Office SMPK at 15.00 hours on 16.11.2021. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage. The bidder is requested to submit any queries in writing to reach the Employer at least one day before the pre-bid meeting.

All the participating bidders will be notified regarding the information of the minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be uploaded in the e-procurement portal. Any modification of the bidding documents as listed above may become necessary as a result of the pre-bid meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause- 9 of this section and not through the minutes of the pre-bid meeting.

Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

a. It is proposed to hold a Pre-bid meeting in order to clarify and discuss issues with respect to the Project, or any other related issues. The meeting shall be held on 16.11.2021 in the office of Chief Engineer, 2ND Floor, Head Office Building, Kolkata Port Trust, at Kolkata and would start at 15.00 hours on virtual mode through below mentioned link

Topic of Meeting- Pre Bid Meeting for EPC of 7 NSD Berth of KDS
Link of Zoom Meeting
https://zoom.us/j/92454810250?pwd=UFErRysvNFhEZmZCajVvRHZJTUxwdz09

Meeting ID: 924 5481 0250
Passcode: 741813

b. Pre-bid meeting will be held in the presence of the tenderers/their representatives who may be present. Any claim or query on any issue, at a later date will not be entertained.

c. Tenderers are advised to forward their queries for pre-bid to e-mail: sk.halder@kolkataporttrust.gov.in & r.mondal@kolkataporttrust.gov.in if any at least one day before 16.11.2021 and attend in virtual mode(online) the Pre-bid meeting.

d. All the queries raised in the pre-bid meeting along with clarifications will be uploaded in the website.

e. All enquires shall be addressed to the following address in writing by letter or facsimile transmission.

f. No interpretation, revision, or other communication from the Port Trust regarding this solicitation is valid unless in writing and is signed by the Chief Engineer, SYAMA PRASAD MOOKERJEE PORT, KOLKATA 700 001, West Bengal (India) written copies of the Port Trust responses, including a description of the enquiry but without identifying its source will be sent to all the Tenderers.

g. During the Pre-Bid meeting, the queries received in advance would be clarified first, followed by those raised during the meeting. The SYAMA PRASAD MOOKERJEE PORT, KOLKATA's response would be uploaded in the website.

h. The Tenderer(s) has to make a complete & careful examination and independent evaluation of the tender notice, scope of work, technical specifications, site, local conditions, physical qualities of ground, sub-soil conditions and all information provided by the SYAMA PRASAD MOOKERJEE PORT, KOLKATA in the tender and has to determine to his satisfaction the accuracy, nature and extent of difficulties, risks that are likely to be faced by him during the course of execution/performance of its obligations as per contract. Any clarifications ambiguities and inconsistencies in the tender shall be raised by the tenderer along with other tenderers in the pre-bid meeting only but not after opening of the bids.
No claim on this account will be entertained.

9. Amendment of Bidding Documents

Before the deadline for submission of bids, the Employer may modify the bidding documents by using addendum. Any addendum thus issued shall be part of the bidding documents and shall be communicated through SMPK website to all the purchasers of the bidding documents. Prospective bidders shall acknowledge receipt of each addendum.

To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend as necessary the deadline for submission of bids, in accordance with Clause-19 of this section.

10. Language of The Bid

All documents relating to the bid shall be in English language.

11. Documents Comprising the Bid

Documents Comprising the Bid

The bid submitted by the bidder shall comprise of necessary details as mentioned in:

I. PART – A-General Information

II. PART B- Commercial Bid

III. PART C- Technical Bid

IV. PART D- Price Bid

The tender should submit the tender documents in two parts:

1st part comprises of I, II & III.

2nd part is for "Price Bid" that is 'IV' above only.

12. Bid Prices

The contract shall be for the whole works, at the lump-sum price submitted by the Bidder.
The bidder shall fill in lump-sum price for Works described in the Bidding Documents.

The Bidder shall fill in lump-sum price (both in figures and words) for whole work described in the Bidding Documents.
The bidder also filled the amount for individual items attached with bidding document and arrive at the total cost to justify the lump-sum amount they quoted for the work.

Except GST all duties, taxes, and other levies payable by the contractor under the contract, or for any other cost shall be included in the financial Bid Price submitted by the Bidder.

13. Currencies of Bid and Payment

The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees.

14. Bid Validity

Bids shall remain valid for a period not less than 180 days from the date of opening of the bid document, bid valid for a shorter period shall be rejected by the Employer as non- responsive.
In exceptional circumstances, prior to expiry of the original time limit, the Employer may request the bidders to extend the period of validity for a specified additional period. The bidders' responses shall be made in writing or by e-mail. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be permitted to modify his bid.

15. Bid Security (Earnest Money Deposit: EMD)

Earnest money Deposit (EMD): Exempted, as per Ministry of Finance Circular No.F.9/4/2020-PPD, Dt.12.11.2020 valid upto 31.12.2021. Bid Security declaration is to be submitted as per proforma.

16. Alternative Proposals by Bidders

Conditional offer or Alternative offers will not be considered in the process of tender evaluation.

17. Format and Signing of Bids

The Bid shall be submitted as per instructions to Bidders for online e-bid submission through e-tendering and e-procurement.

SUBMISSION OF BIDS

18. Sealing and Marking of Bids

The bidder shall also upload the scanned copies of the documents mentioned in
Technical Bid &Financial bid as per clause-11 of this section.
The Tender complete in all respect should be uploaded upto 15.00 hours on 09.12.2021 and will be open after 15:00 hours on 10.12.2021.In case of opening date is a holiday, the tender will be opened on the next working date in presence of such of the tenderers who may wish to be present.

19. Deadline for Submission of Bids

Bids must be received by the Employer at the Enivida Portal not later than at 15:00 hrs of 09.12.2021.
In the event of the specified date for the submission of bids being declared a holiday by the Employer, the Bids will be received upto the appointed time on the next working day.

The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 9 of this section in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new dead line.

20. Late Bids

Any Bid uploaded after the deadline will not be accepted.

21. Modification and withdrawal of Bids

Bidders may modify or withdraw their bids before the deadline prescribed in Clause-19 of this section. No bid may be modified after the deadline for submission of Bids.
Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity or as extended may result in suspension of business with SMPK for a period 3 (Three) years apart from blacklisting the firm.

BID OPENING AND EVALUATION

22. Bid Opening

On the due date and appointed time as specified in clause 19 of this section, the Employer will first open Technical bids of all bids received in presence of the Bidders or their representatives who choose to attend. In the event of the specified date for Bid opening being declared a holiday by the Employer, the bids will be opened at the appointed time and location on the next working day.

If all Bidders have submitted unconditional Bids together with requisite Bid security, then all Bidders will be accessed by the SMPK .If any Bid contains any deviation from the Bids documents and/or if the same does not contain Bid security in the manner prescribed in the Bid documents, then that Bid will be rejected and the Bidder informed accordingly. All valid Financial Bids whose technical bids have been determined to be substantially responsive in accordance with Clause 25 of this section , shall be opened on the specified date from declaring the results of the Technical Bid, in

presence of the bidders or their representatives who choose to attend. The Bidder's name, the Bid prices, the total amount of each bid, any discounts and such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. Any bid price, discount, which is not read out and recorded at Bid opening, will not be taken into account for Bid evaluation.

23. Process to be Confidential

Information relating to the examination, clarification, evaluation and comparison of the bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful bidder has been announced.

24. Clarification of Bids

To assist in the examination and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid. The request for clarification and the response shall be in writing, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to conform the correction of arithmetic errors discovered by the Employer in the process of evaluation of the Bids in accordance with Clause 25 of this section. No Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening upto the time, the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, he should do so in writing, but that is not binding on SMPT to accept.

Any effort by the Bidder to influence the Employer's bid evaluation, bid comparison or contract award decisions may result in rejection of his bid.

25. Examination of Bids and Determination of Responsiveness

Prior to detailed evaluation of Bids, the Employer will determine whether(a) each Bid meets the eligibility criteria defined in Clause -3 of this section (b) bid document has been properly signed by an authorised signatory (accredited representative) holding Power of Attorney in his favour. The Power of Attorney shall inter alia include a provision to bind the Bidder to settlement of disputes clause; (c) is accompanied by the required Bid security and (d) is responsive to the requirements of the Bidding documents.

A substantially responsive Technical and Financial Bid is one, which conforms to all the terms, conditions and specification of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality or performance of the Works; (b) which limits in any substantial way, the Employer's rights or the Bidder's obligations under the Contract; or (c) whose rectification would affect unfairly the competitive position of other bidders presenting responsive Bids.

If a Technical Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

The Financial bid of those bidders whose Technical bid has been determined to be non-responsive shall not be opened.

26. Correction of Errors

Bids determined to be responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:

Where there is a discrepancy between the lump-sum price in figures and in words, the lump-sum price in words will govern; and the amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and shall be considered as binding upon the bidder. If the Bidder does not accept the corrected amount the Bid will be rejected, and the Bidder will be suspended from business with SMPK for a period 3 (Three) years apart from blacklisting of the firm.

27. If the Bidder that submitted the lowest evaluated bid does not accept the correction of errors, its bid shall be rejected.

28. Evaluation and Comparison of Financial Bids

The Employer will evaluate and compare only the Bids determined to be responsive in accordance with Clause-25 of this section for the responsive technically qualified bidders. In evaluating the Bids, the Employer will determine for each Bid, the evaluated Bid Price by adjusting the Bid Price by making any correction for errors pursuant to Clause-26 of this section.

If the Bid of the successful Bidder is seriously unbalanced in relation to the Engineer-in-charge (Nodal Officer) or his nominee's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the implementation/construction methods and schedule proposed.

AWARD OF CONTRACT

29. Award Criteria

The Employer will award the Contract to the Bidder whose Bid has been determined to be responsive to the Bidding documents and who has offered the lowest Bid Price, provided that such Bidder has been determined to be (a) eligible in accordance with the provisions of Clause- 2 of this section, and (b) qualified in accordance with the provisions of Clause 3 of this section.

30. Employer's Right to accept any Bid and to reject any or all.

Not with standing to clause 29 of this section, the Employer reserve the right to accept or reject any bid and to cancel the bidding process and reject all bids, at any time prior to the award of contract, without assigning any reason and there by incurring any liability to the affected bidder or bidders of the grounds for Employer's action.

31. Notification of Award and Signing of Agreement.

The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid-validity period by email/Fax and also confirmed by registered letter. This letter (here in after and in the Conditions of Contract called the "letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract (here in after and in the Contract called the "Contract Price"). The notification of award will constitute the formation of the Contract subject only to the furnishing of a performance security in accordance with the provisions of Bidding Documents. The Agreement will incorporate all correspondence between the Employer and the successful Bidder within 21 days of receipt of LOI/Work Order, the successful Bidder will furnish the performance security and sign the Agreement with the Employer.

It will be signed by the Employer and sent to the successful Bidder within 28 days following the notification of award along with the Letter of Acceptance. Upon furnishing of Performance Security by the successful Bidder , the Employer will promptly notify the other Bidders that their Bids are unsuccessful.

32. Performance Security

Security Deposit shall consist of two parts; i) Performance Guarantee to be submitted at award of work and ii) Security Deposit to be recovered from Running Bills.

Performance Guarantee:

a. The Contractor should submit a Performance Guarantee in the form of B.G. for 3 % of contract value in SMPK's proforma from a Scheduled/ Nationalised Bank within 21 days from the date of receipt of LOI/Work Order, failing which the contract would be rescind without any further notice. The P.G. should be obtained for the full period covering defect liability period of 10 (Ten)years.

The P.G shall be accepted with effect from the date of W.O/LOI. The SMPK bank account details to which amount is to be transferred (accepted only online payable through DD / RTGS / NEFT / Bank Transfer etc) is mentioned below:

A/C: Syama Prasad Mookerjee Port, Kolkata A/c No: 067502000000491
IFSC: IOBA0000675
Bank Name: Indian Overseas Bank Branch Name: STRAND ROAD Branch, Kolkata

NOTE: The Ministry of Finance Guidelines regarding Bid Security / Earnest Money Deposit /Performance Guarantee / Security Deposit instructions issued vide no. F/9/4/2020-PPD, dt.12-11-2020 will be applicable for all the tenders till 31-12-2021.

The contractor shall be required to deposit an amount equal to 3% of the tendered value of the contract as Performance Guarantee. Performance Guarantee is to be furnished within 21 (twenty-one) days after notification of the award and it should remain valid for a period of 60 (sixty) days beyond the date of completion of all contractual obligations of the contractor, including Defect Liability Period (DLP). The performance security will be forfeited and credited to the procuring entity's account in the event of a breach of contract by the contractor.

Refund of performance Guarantee:

The performance guarantees to be refunded to the contractor without interest, after he duly performs and completes all obligations under the contract but not later than 365 days of completion of the Defect Liability Period (DLP).

The Security deposit (SD):

(i)The SD amount will be deducted from running on account bills as per clause no.3.4 & 3.5 of GCC and Earnest money if any will also converted into Security Deposit.

(ii)The Security Deposit shall be refunded to the Contractor in terms of Clause 28(iii) hereinafter and subject to deduction, if any, under the provision of Sub-clause 28 (iv) herein below. Id, however, the Contract provides for any maintenance period. 50% of the Security Deposit may be refunded against any of the treasury Receipt for that amount on expiry of half of the maintenance period and the balance deposit on the expiry of the said maintenance period and after the Engineer

has certified the final completion of work in Form G.C.2 and the Contractor has submitted his "No Claim" Certificate in Form G.C.3.

iii) The Security Deposit/Earnest Money may be liable to forfeiture at the option of the Trustees, if the Contractor fails to carry out the work or to perform/observe any of the conditions of the Contract. The Trustees shall also be at liberty to deduct any of their dues from the Security Deposit, fixed Security, Earnest Money or from any sum due or to become due to the Contractor under any other contract

(iv) The Contractor shall not be considered completed the work and the work shall not be treated as finally accepted by the Trustees, until a Final Completion Certificate in Form G.C.2 annexed hereto shall have been signed and issued by the Engineer of the contractor after all obligations under the Contract including that in the maintenance period, if any, have been fulfilled by the Contractor. Previous entry on the works or taking possession, working on using thereof by the Trustees shall not relieve the Contractor of his obligations under the contract for full and final completion of the work.

(v) On completion of the contract in the manner aforesaid, the Contractor may apply for the refund of his Security Deposit by submitting to the Engineer (I) The Treasury Receipts granted for the amount of Security held by the Trustees, and (ii) his "No further claim" Certificate in Form G.C.3 annexed hereto (in original), where upon the Engineer shall issue Certificate in Form G.C.2 and within two months of the Engineer's recommendation, the Trustees shall refund the balance due against the Security Deposit to the Contractor, after making deduction therefrom in respect of any sum due to the Trustees from the Contractor.

33. Advance Payments

No advance payment will be made for the subject work.

34. Corrupt or Fraudulent Practices

The Employer requires that Bidders/Suppliers/Contractors under this contract, observe the highest standard of ethics during the procurement and execution of this contract. In pursuance of this policy, the Employer:

It defines, for the purpose of these provisions, the terms set forth below as follows:

(i) **"corrupt practice"** means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution;

and

(ii) **"fraudulent practice"** means a mis-representation off acts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

NOTES- SMPK will reject a proposal for award of work if he determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

will declare a Bidder ineligible, either indefinitely or for a stated period of time, to be awarded a contract/contracts if found any time determines that the Bidder has engaged in corrupt or fraudulent practices in competing for, or in executing, the contract.

Furthermore, Bidders shall be aware of the provision stated in clause 50 of the Special Conditions of Contract.

SECTION-2

FORMS OF BID, QUALIFICATION INFORMATION

AND

LETTER OF ACCEPTANCE

TABLE OF FORMS

1 FORM OF BID

2 PRE-QUALIFICATIONS OF BIDDERS
3 PRE-QUALIFICATION OF BIDDERS
4 LETTER OF ACCEPTANCE
5 NOTICE TO PROCEED WITH THE WORK
6 AGREEMENT FORM

SPECIMEN FOR FORM OF BID
(To be executed on bidder's letter head)

[The Tenderer shall fill in this Form in accordance with the instructions indicated No alterations to its format shall be permitted and no substitutions shall be accepted The Form shall be submitted in both the Techno- Commercial and Price Covers separately.]

Date
Title Name
Tender No

[The Tenderer shall fill in this Form in accordance with the instructions indicated No alterations to its format shall be permitted and no substitutions shall be accepted The Form shall be submitted in both the Techno- Commercial and Price Covers separately.]

To

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

We, the undersigned, declare that:

a. We have examined and have no reservations to the Tendering Documents, including Addendum and Clarifications issued after Pre-bid meeting along with Minutes;

b. We offer to execute the work in conformity with the Tendering Documents and in accordance with the Delivery Schedules specified in then Schedule of Requirements;

c. The total price of our Tender for the entire work is Rs. ---------- (Rupees) {**Not to be Quoted here**}

d. Our tender shall be valid for the period of time specified in **[ITB]**, from the date fixed for the Tender submission deadline in accordance with **[ITB]**, and it shall remain binding upon us and may be accepted at any time before the expiration of that period or any extended period in accordance with **[ITB]**;

e. If our tender is accepted, we commit to obtain a performance guarantee in accordance with **[ITB]** for the due performance of the Contract, as specified in specimen form for the purpose;

f. We, including any subcontractors or Contractors for any part of the contract, [insert the nationality of the Tenderer, including that of all parties that comprise the Tenderer, if the Tenderer is a JV and the nationality each sub-contractor and Contractor];

g. We have no conflict of interest in accordance with **[ITB]**;

h. Our firm, its affiliates or subsidiaries—including any sub-contractors or Contractors for any part of the contract—has not been declared ineligible by the Port, under laws of India or official regulations, in accordance with **[ITB]**;

i. We understand that this Tender, together with your written acceptance thereof included in your notification of award, shall constitute a binding contract between us, until a formal contract Agreement is prepared and executed in accordance with **[ITB]** and as per specimen form the purpose;

j. We understand that you are not bound to accept the lowest evaluated Tender or any other Tender that you may receive.

k. We also make a specific clause of [ITB, NIT] under which the Contract is governed.

l. In case of Out Station Firms, having a branch in India for liaison purposes, please mention the Name of the Contact person and Tel. No., Fax No., and mail- Id and also the Complete Postal Address of the Firm.

m. We understand that the Communication made with the Firm at, by the Port shall be deemed to have been done with us.

Signed: [insert signature of person whose name and capacity are shown]
In the capacity of [insert legal capacity of person signing the Form of Tender]

Name: [insert complete name of person signing the Form of Tender]

Duly authorized to sign the Tender for and on behalf of: [insert complete name of Tenderer]

Dated on day of , [insert date of signing]

PRE-QUALIFICATION OF BIDDERS

The information to be filled in by the Bidder in the following pages will be used for purposes of Pre-Qualification as provided for in the Instructions to Tenderers.

1. **Only for Individual Bidders**

Constitution or legal status of Bidder (Attach copy)

- Place of registration:
- Principal place of business
- (Power of Attorney of signatory of Bid (Attach)

2. **Turnover of the Firm/JV**

Year	Turnover
[INSERT THE YEARS AS PER PQC, ***i.e. LAST THREE FINANCIAL YEARS ENDING 31ST MARCH OF THE PRVIOUS YEAR]***	

Attachments:

Financial reports for the last three years: balance sheets, profit and loss statements, auditors' reports (in case of companies/ corporation) etc. List them below and attach copies.

The same should be audited as per relevant norms wherever required along with UDIN of the Auditor.

3. **Infrastructure works related to Construction of Jetty / berth / wharves or construction of heavy industrial building or construction of water retaining structure like dam, anicut structure or Construction of RCC bridges. All these works must be carried out involving RCC & pile/sheet pile works** .

Particulars	Year	No. of works	Value
Total value of completed similar work as defined in the tender document during last 7 years			

4 Attachments: Supporting documents, viz., Successful completion certificates from clients, other documentations to substantiate the similarity of work as per definition of “Similar Work”. Employers reserves the right to verify the information;

5.Information on Bid Capacity (works for which bids have been submitted and works which are yet to be completed) as on the date of this bid.

(A) Existing commitments and on-going works:

Description of work	Place & state	Contract No. & Date	Name and Address of Port	Value of Contact (Rs. Million)	Stipulated period of completion	Value of remaining to be completed	Anticipated date of completion
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

(B) Works for which bids already submitted:

Description of work	Place & State	Name and Address of Port	Stipulated period of completion	Date when decision is expected	Remarks if any
(1)	(2)	(3)	(4)	(5)	(6)

*Attach certificate(s) from the Engineer-in-charge (Nodal Officer) or his nominee(s)-in-Charge.

6. The following Contractor's Equipment are essential for carrying out the works. The Bidder should list all the information requested below:

Item of equipment	Requirement No. Capacity	Owned/leased/to be procured	Nos. /Capacity	Age /Condition	Remarks (From whom to be purchased)
(1)	(2)	(3)	(4)	(5)	(6)

7. Qualifications and experience of key personnel proposed for administration and execution of the Contract. Attach biographical data. Refer also to Sub Clause 4.3 (e) of instructions to Bidders and Sub Clause 9.1 of the Conditions of Contract.

Position	Name	Qualification	Years of experience (general)	Years of experience in the proposed position
Project Manager				
Discipline Specialist etc.				

8. Proposed sub-contracts and firms involved

Sections of the works	Value of sub-contract	Sub-contractor (name and address)	Experience in similar work

9. Information on litigation history in which the Bidder is involved.

Other party (ies)	Port	Cause of dispute	Amount	Remarks involved showing present status.

Additional Information Bidder may like to submit duly authorized to sign this Authorization on behalf of [insert complete name of Tenderer]
Dated on day of, [insert date of signing]

LETTER OF ACCEPTANCE
(On letter head paper of the Port)

_____(date)

To:_____
(name and address of the Contractor)

Dear Sirs,

Sub: Tender No.

Title of the Tender:

Ref: Your bid dated ***And*** [list of correspondence with the bidder]

This is to notify you that your Bid dated_____for execution of the _____(name of the contract and identification number, as given in the Instructions to bidders) for the Contract Price of Rupees _____ (amount in words and figures as corrected and modified in accordance with the Tender Document is hereby accepted by the Employer/ Board.)

You are hereby requested to furnish Performance Guarantee, in the form detailed in Tender Document for anamount of Rs._____Within 21 days of the receipt of this letter of acceptance.

Detailed Letter of Acceptance will follow.

Please acknowledge receipt.

Yours faithfully,

CHIEF ENGINEER,KDS

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

ISSUE OF NOTICE TO PROCEED WITH THE WORKS

(letter head of the Port)

.....dated

[Only for those tenders requiring separate commencement letter especially when site handing over is required as per tender conditions]

To
(name and address of the Contractors)

Dear Sirs,

Sub: Tender No.

Title of the Tender:

Ref: Letter of Acceptance No. dated:

Pursuant to your furnishing the requisite Performance Guarantee and Bid security as stipulated in ***Tender Document*** and signing of the contract for execution of the said work, you are hereby instructed to proceed with the execution of the works in accordance with the contract documents. It is hereby notified that the ***site i****s being handed over to you w.e.f.****[date]*****.....*** *for execution of work in accordance with the contact documents.*

Yours faithfully

(Signature, name and title of
signatory authorised to sign on
behalf of Employer/Board)

SPECIMEN CONTRACT AGREEMENT
(To be executed on Rs.100/- non-judicial Stamp Paper)

[The successful Tenderer shall fill in this form in accordance with the instructions indicated]

THIS CONTRACT AGREEMENT is made

The no…….day of…….month..... *year*

BETWEEN

(1) The Trustees of Port of **SYAMA PRASAD MOOKERJEE PORT, KOLKATA**, an Autonomous Body of the Ministry of SHIIPING of the Government of INDIA, incorporated under the Major Port Trust Act,1963 as Amended there after, under the Laws of India and having its principal place of business at **SYAMA PRASAD MOOKERJEE PORT, KOLKATA, 700 001** (herein after called "The Port"),

and

(2) ……..(name of Contractor) [incorporated under] the laws of …….(country of Contractor) and having its principal place of business at ……(address of Contractor) (herein after called "the Contractor").

WHEREAS

The Employer/Board invited Tenders against tender no…….for execution of..... **[TENDER TITLE AND BRIEF DESCRIPTION]** viz., and has accepted a Tender by the Contractor in accordance with the supply/ delivery schedules, in the sum of Contract Price.....(in words and figures, expressed in the Contract currency(ies)) (herein after called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall constitute the Contract between the Employer/Board and the Contractor and each shall be read and construed as an integral part of the Contract:

(a) This Contract Agreement;

(b) Special Conditions of Contract;

(c) General Conditions of Contract;

(d) Technical Requirements (including Schedule of Requirements and Technical Specifications, drawings);

(e) Notice Inviting Tender;

(f) Replies issued to the Pre-bid queries, addendum if any issued ***[numbers and dates];***

(g) The Contractor's Bid and original Price and Delivery Schedules;

(h) The Employer/Board's Notification of Award;

(i) [***Correspondence the Employer/ Board had exchanged with the bidder till and after award of contract [specific letters and dates***];

(j) *And* ***[Add here any other document(s)]***

AND WHEREAS

3. EMPLOYER/ BOARD accepted the Bid of CONTRACTOR for the provision and the execution of WORK at the CONTRACT PRICE as indicated in CONTRACT upon the terms and subject to the conditions of Contract. Now this CONTRACT AGREEMENT witnesseth and it is hereby agreed and declared as follows:

4. In consideration of the payment to be made to CONTRACTOR for WORK to be executed by him. CONTRACTOR hereby Covenants with EMPLOYER/ BOARD that CONTRACTOR shall and will duly provide, execute and complete Work and things in CONTRACT, mentioned or described or which are to be implied there from or may be reasonably necessary for completion of Work and at the times and in the manner and subject to the terms and conditions or stipulations mentioned in CONTRACT.

5. In consideration of the due provision, execution and completion of WORK by the CONTRACTOR in accordance with the terms of the CONTRACT, the EMPLOYER/BOARD does hereby agree with CONTRACTOR that EMPLOYER/ BOARD will pay to Contractor the respective amounts for the work actually done by him and approved by EMPLOYER/ BOARD as per Payment Terms accepted in CONTRACT and payable to CONTRACTOR under provision of Contract at such time and at such manner as provided for in the CONTRACT.

AND

6. In consideration of the due provision, execution and completion of WORK, CONTRACTOR does hereby agree to pay such sums as may be due to EMPLOYER/ BOARD for the services rendered by EMPLOYER/ BOARD to Contractor as set forth in CONTRACT and such other sums as may become payable to EMPLOYER/ BOARD towards loss, damage to the EMPLOYER/ BOARD's equipment, materials etc. and such payments to be made at such time and in such manner as is provided in the CONTRACT.
IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of ..... *[insert the name of the Contract governing* law *country]* on the day, month and year indicated above.

For and on behalf of the Employer/Board
Signed ..... *[insert signature]*
in the capacity of .....*[insert title or other appropriate designation]*
in the presence of..... *[insert identification of official witness]*

For and on behalf of the Contractor
Signed ..... *[insert signature of authorized representative(s) of the Contractor]*
In the capacity of .....*[insert title or other appropriate designation]*
In the presence of..... *[insert identification of official witness]*

CONTRACTOR **CHIEF ENGINEER,KDS**

SECTION-3

GENERAL CONDITIONS OF CONTRACT

ANNEXURE – F

General Conditions of Contract Forms and Agreements

Sanctioned by the Trustees under Resolution No. 92 of the 6th Meeting held on 27th May, 1993

Including Addendum Sanctioned by the Trustees Meeting held on July, 2014

KOLKATA PORT TRUST

KOLKATA DOCK SYSTEM
&
HALDIA DOCK COMPLEX

JULY, 2014

GENERAL CONDITIONS OF CONTRACT

	CLAUSE		**PAGES**
1.	AMENDMENT TO GENERAL CONDITIONS OF CONTRACT	**…**	**GC 1**
2.	DEFINITION	**…**	**GC 2 – GC 3**
3.	DUTIES & POWERS OF ENGINEER & ENGINEER'S REPRESENTATIVE	**…**	**GC 3 – GC 5**
4.	THE TENDER/OFFER AND ITS PRE-REQUISITES	**…**	**GC 5 – GC 9**
5.	THE CONTRACT & GENERAL OBLIGATIONS OF CONTRACTOR	**…**	**GC 9 – GC 14**
6.	COMMENCEMENT, EXECUTION AND COMPLETION OF WORK	**…**	**GC 14 – GC 17**
7.	TERMS OF PAYMENT	**…**	**GC 18 – GC 20**
8.	VARIATION AND ITS VALUATION	**…**	**GC 20 – GC 22**
9.	DELAY/EXTENSION OF COMPLETION TIME/LIQUIDATED DAMAGE/TERMINATION OF CONTRACT	**…**	**GC 22 – GC 24**
10.	MAINTENANCE AND REFUND OF SECURITY DEPOSIT	**…**	**GC 24 – GC 25**
11.	INTERPRETATON OF CONTRACT DOCUMENTS, DISPUTES & ARBITRATION	**…**	**GC 25 – GC 27**
12	FORMS GC-1, GC-2 , GC-3		
13	FORM OF AGGREMENT		
14	PROFORMA FOR B.G. FOR CONTRACT PERFORMANCE		
15	INTEGRITY PACT DOCUMENT: PROFORMA		
16	DRAFT Memorandum of Understanding between SMP, Kolkata. & Transparency International India		

GC - 1

AMENDMENT TO

GENERAL CONDITIONS OF CONTRACT

❖ Cl-3.4 THE TENDER /OFFER & ITS PRE-REQUISITES

Table under sub-clause (a)

PREVIOUS			**AS AMENDED**		
Estimated Value of Work	**Amount of Earnest Money**		**Estimated Value of Work**	Amount of Earnest Money	
	For Works Contract	**For Contract of Supplying Materials or Equipment only**		**For Works Contract**	For Contract of Supplying Materials or Equipment only
Up to Rs. 1,00,000=00	**5% of the estimated value of work**	**1% of the estimated value of work**	**Up to Rs. 10 Crore**	2% of the estimated value of work	1% of the estimated value of work
Over Rs. 1,00,000.00	**2% of the estimated value of work subject to a maximum of Rs. 20,000/- and minimum of Rs. 5,000/-.**	**½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.**	**Over Rs. 10 Crore**	2% on first Rs. 10 Crore + 1% on the balance	½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.

[AMENDMENT SANCTIONED BY THE BOARD OF TRUSTEES VIDE RESOLUTION NO 210 OF THE TRUSTEES' MEETING HELD ON 26.02.2013]

Table under sub-clause (d)

PREVIOUS			**AS AMENDED**		
Class of Registration	Amount Of Fixed Security	Financial Limit Of Each Tender	Class of Registration	Amount Of Fixed Security	Financial Limit Of Each Tender
A	Rs 10,000/-	Any tender priced upto Rs 2,00,000/-	**A**	Rs 50,000/-	Any tender priced up to Rs 10,00,000/-
B	Rs 5,000/-	Any tender priced upto Rs 1,00,000/-	**B**	Rs 25,000/-	Any tender priced upto Rs 5,00,000/-
C	Rs 2,500/-	Any tender priced upto Rs 50,000/-	**C**	Rs 15,000/-	Any tender priced upto Rs 3,00,000/-

[AMENDMENT SANCTIONED BY THE BOARD OF TRUSTEES VIDE RESOLUTION NO 82 OF THE TRUSTEES' MEETING HELD ON 12.10.2012]

GC - 2

1. DEFINITIONS

1.0	**In the contract, as here in after defined, the following words and expressions shall have the meaning herein assigned to them, except where the context otherwise required.**	
1.1	**"Employer" or "Board" or "Trustees" means of the Board of Trustees for the Port of Calcutta, a body corporate under Section 3 of the Major Port Trusts Act, 1963, including their successors, representatives and assigns.**	**Employer**
1.2	**"Chairman" means the Chairman of the Board and includes the person appointed to act in his place under Sections 14 and 14A of the Major Port Trusts Act, 1963**	**Chairman**
1.3	**"Contractor" means the person or persons, Firm or Company whose tender/offer has been accepted by the Trustees and includes the Contractor's representatives, heirs, successor and assigns, if any, permitted by the Board/Chairman.**	**Contractor**
1.4	**"Engineer" means the Board's official who has invited the tender on its behalf and includes the Manager (Infrastructure & Civic Facilities) or other official as may be appointed from time to time by the Employer, with written notification to the Contractor, to act as Engineer for the purpose of the Contract, in place of the "Engineer" so designated.**	**Engineer**
1.5	**"Engineer's Representative" means any subordinate or Assistant to the Engineer or any other official appointed from time to time by the Engineer to perform the duties set forth in Clauses 2.4 to 2.6 hereof.**	**Engineer's Representative**
1.6	**"Work" means the work to be executed in accordance with the Contract and includes authorised "Extra Works" and 'Excess Works" and "Temporary Works".**	**Works**
1.7	**"Temporary Works" means all temporary works of every kind required in or about the execution, completion or maintenance of the works and includes (without thereby limiting the foregoing definitions) all temporary erections, scaffolding, ladders, timbering, soaking vats, site offices, cement and other godowns, platforms and bins for stacking building materials, gantries, temporary tracks and roads, temporary culverts and mixing platforms.**	**Temporary works**
1.8	**"Extra Works" means those works required by the Engineer for completion of the Contract which were not specifically and separately included in the schedule of items of the works i.e. (Bill of Quantities) of the tender. "Excess Works" means the required quantities of work in excess of the provision made against any item of the bill of Quantities.**	**Extra works and Excess works**
1.9	**"Specifications" means the relevant and appropriate Bureau of Indian Standard's specifications / International Standard's Specifications (latest revisions) for materials and workmanship unless stated otherwise in the Tender.**	

1.10	**"Drawings" means the drawings referred to in the Tender and specification and any modification of such drawings approved in writing by the Engineer and such other drawings as may from time to time be furnished or approved in writing by the Engineer.**	**Drawings**
1.11	**"Contract" means and includes the General and Special Conditions of Contract, Specifications, Drawings, priced Bill of Quantities, the Tender / Offer, the letter of acceptance of the Tender/Offer, the Contract Agreement, if separately entered into and the Schedule of Rates and Price, if any, adopted by the Trustees at their discretion.**	**Contract**
1.12	**"Constructional Plant" means all appliances or things of whatsoever nature required or about the execution, completion or maintenance of the works or temporary works and includes (without thereby limiting the foregoing definition) all machinery and tools but does not include materials or other things intended to form or forming part of the permanent works.**	**Constructional Plant**
1.13	**"Site" means the land, waterways and other places, on, under, in or through which the works are to be executed by the Trustees for the purpose of the Contract.**	**Site**
1.14	**"Contract Price" means the sum named in the letter of acceptance of the Tender/Offer of the Contractor, subject to such additions thereto and deductions therefrom as may be made by the Engineer under the provisions here in after contained.**	**Contract Price**
1.15	**"Month" means English Calendar Month.**	**Month**
1.16	**"Excepted Risks" are riot in so far as it is uninsurable, war, invasion, act of foreign enemies, hostilities) whether war be declared or not), Civil War, rebellion, revolution, insurrection or military or usurped power or use or occupation by the Trustees of any portion of the works in respect of which a certificate of completion has been issued (all of which are herein collectively referred to as the excepted risks).**	**Excepted Risks**
1.17	**Word importing the singular only, also includes the plural and vice-versa where the context so requires.**	**Singular/ Plural**
1.18	**The heading and marginal notes in these General Conditions of Contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.**	**Headings/ Marginal Notes.**
1.19	**Unless otherwise stipulated the work "Cost" shall be deemed to include overhead costs of the Contractor, whether on or off the site.**	**Cost**
2.0	**DUTIES & POWERS OF ENGINEER & ENGINEER'S REPRESENTATIVE.**	
2.1	**The Contractor shall execute, compete and maintain the works in terms of the contract to the entire satisfaction of the Engineer and Shall comply with the Engineer's direction on any matter whatsoever.**	**Engineer's Authority**

2.2 **The Contractor shall take instructions from the Engineer and subject to limitation of Clause 2.5 hereof, from the Engineer's Representative.**

Authority of Engineer's Representative

2.3 ***The Engineer shall have full power and authority:***

Engineer's Power

(a) to supply to the contractor from time to time during the progress of the works such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the works and the contractor shall carry out and be bound by the same.

(b) to alter or modify the specification of any material and workmanship and to inspect the work at any time.

(c) to order for any variation, alteration and modification of the work and for extra works.

(d) to issue certificates as per contract.

(e) to settle the claims & disputes of the Contractor and Trustees, as the first referee.

(f) To grant extension of completion time.

2.4 ***The Engineer's Representative shall:***

Power of Engineer's Representative.

(i) watch and supervise the works.

(ii) test and examine any material to be used or workmanship employed in connection with the work.

(iii) have power to disapprove any material and workmanship not in accordance with the contract and the contractor shall comply with his direction in this regard.

(iv) take measurements of work done by the contractor for the purpose of payment or otherwise.

(v) order demolition of defectively done work for its reconstruction all by the Contractor at his own expense.

(vi) have powers to issue alteration order not implying modification of design and extension of completion time of the work and

(vii) have such other powers and authorities vested in the Engineer, which have been delegated to him in writing by the Engineer under intimation to the Contractor.

2.5 ***Provided always that the Engineer's Representative shall have no power:***

Limitation of Engineer's Representative's Power

(a) to order any work involving delay or any extra payment by the Trustees,
(b) to make variation of or in the works; and
(c) to relieve the Contractor of any of his duties or obligations under the Contract.

2.6 Provided also as follows:

Engineer's Overriding Power

(a) Failure of Engineer's Representative to disapprove any work or materials shall not prejudice the power of the Engineer thereafter to disapprove such work or materials and to order the pulling down, removal, breaking-up thereof and re-constructing at the contractor's cost and the contractor shall have no claim to compensation for the loss if any sustained by him.

(b) If the contractor shall be dissatisfied by reason of any decision of the Engineer's Representative, he shall be entitled to refer the matter to the Engineer who shall thereupon confirm, reverse or vary such decision.

(c) Any written instructions or written approval given by the Engineer's Representative to the contractor, within the terms of delegation of power and authority vested in the Engineer to his Representative in writing, shall bind the contractor and the Trustees as though it had been given by the Engineer, who may from time to time make such delegation.

3.0 THE TENDER/OFFER AND ITS PRE-REQUISITES

3.1 The Contractor shall, before making out and submitting his tender/offer, be deemed to have inspected and examined the site, fully considered all factors, risks and contingencies, which will have direct and indirect impact on his expenses and profit from the work and shall be specifically deemed to have taken the following aspects into consideration:

The tender must encompass all relevant aspects/ issues.

(a) The form and nature of the site and its surroundings including their sub-surface, hydrological, tidal and climatic conditions, the means of access to the site and all other local conditions, including the likely charges and costs for temporary way-leave, if any, required for the work.

Site & Local condition.

(b) The drawings, specifications, the nature and extent of work to be executed and the quality, quantity and availability of the required materials and labour for the work and the need to execute the

Drawing/ Specification/ Nature &

(c) The accommodation required for the workmen and site office, mobilisation/demobilisation and storage of all plant, equipment and Construction materials.	**Accommodation for Contractor's men/materials.**
(d) The sources and means of procurement of water for drinking, washing and execution of work, and source and availability of electrical power, all at Contractor's cost.	**Water for drinking etc. /Electrical power.**
(e) Payment of taxes and duties and compliance of all applicable statutes, ordinances and law together with the rules made thereunder, the rules, regulations and bye-laws of public bodies or any local or other authority by the Contractor, keeping the Trustees indemnified against penalties and liabilities of every kind arising from the Contractor's failure in such compliance.	**Payment of Taxes/duties and observance of all statutes.**
(f) Payment of all kinds of stamp-duty for executing the agreement or for any legal instrument including Bank Guarantees and Indemnity Bonds.	**Payment of Stamp Duty by the Contractor.**

3.2 **The Contractor's tender shall be in ink on the Tender Forms supplied by the Trustees, unless stipulated otherwise in the Notice Inviting the Tender and shall be faultless in figures and free from erasing. Corrections, if any, shall only be made by scoring out and initialling of the revised figure.**

3.3 **If required by the Engineer or the Trustees, the Contractors in their tender or subsequently, shall disclose the names of their owners/partners/share holders at the required points of time. The failure in this regard shall be treated as a breach and a contract, if entered into, shall be liable to be cancelled.** — **Disclosure of Owner's name.**

3.4 **(a) Unless otherwise stipulated in the Notice Inviting Tender / Offer, every tender must be submitted with Earnest Money of the amount calculated as per the following scale.** — **Earnest Money and Security Deposit.**

Estimated Value of Work	Amount of Earnest Money	
	For Works Contract	For Contract of Supplying Materials or Equipment only
Up to Rs. 1,00,000=00	5% of the estimated value of work	1% of the estimated value of work
Over Rs. 1,00,000=00	2% of the estimated value of work subject to a maximum of Rs. 20,000/- and minimum of Rs. 5,000/-.	½% of the estimated value of work subject to a maximum of Rs. 10,000/- and minimum of Rs. 1,000/-.

(b) Earnest Money shall be deposited with the Trustees' treasurer in cash or by Banker's Cheque of any Calcutta Branch of a Nationalised Bank of India drawn in favour of Calcutta Port Trust or in the form of any "Account Payee" Draft of any Nationalised Bank of India drawn in favour of "Calcutta Port Trust" and payable at Calcutta/Haldia, as the case may be, and the receipt granted therefor be kept attached to the Tender/Offer in the Sealed Cover.

Method of Paying E.M.

(c) Earnest Money of unaccepted tender shall be refunded without any interest through A/c. Payee Cheque drawn on a Nationalised Bank of Calcutta / Haldia.

Refund of E.M.

(d) The enlisted (registered) Contractors of the Trustees who have deposited fixed Security with the Trustees' FA & CAO / Manager (Finance) according to his Class of Registration, shall be exempt from depositing the Earnest Money, as per the following scale:

Exemption from E.M. to Regd. Firms

Class of Registration	Amount of Fixed Security	Financial Limit of Each Tender
A	Rs. 25,000/-	Any tender priced up to Rs.5,00,000/-
B	Rs. 10,000/-	Any tender priced up to Rs.2,00,000/-
C	Rs. 5,000/-	Any tender priced up to Rs.1,00,000/-

(e) (i) Tender submitted without requisite Earnest Money may be liable to rejection.

Tender with-out EM liable to rejection.

(ii) If before expiry of the validity period of his Tender/Offer, the tenderer amends his quoted rates or tender/offer making them unacceptable to the Trustees and/or withdraws his tender/offer, the Earnest Money deposited shall be liable to forfeiture at the option of the Trustees.

Forfeiture of E.M. before Acceptance of offer.

(f) The Earnest Money of accepted tender/offer shall be retained by the Trustees as part of the Security Deposit, for which a separate Treasury Receipt shall be issued to the Contractor after cancellation of the previous Receipt of Earnest Money.

E.M. to be converted to part S.D.

(g) Balance security for works contract shall be recovered by deduction from all progressive Bill (including final Bill, if necessary) @ 10% of the gross value of work in each such bill, so that the total recovery may not exceed the quantum computed as per the under noted percentages of the total value of work actually done up to the stage of completion.

Mode of recovery of balance S.D.

Value of Work	% of Security Deposit for works contract.	% of Security Deposit For contract of supply-ing materials & equipment only.
For works up to Rs.10,00,000/-.	10% (Ten percent)	1% (One percent)
For works costing more than Rs.10,00,000/- and up to Rs.20,00,000/-	10% on first Rs.10,00,000/- +7½% on the balance.	1% on first Rs.10,00,000/- + ½% on the balance.
For works costing more than Rs.20,00,000/-	10% on first Rs.10,00,000/- + 7 ½% on the next Rs.10,00,000/- + 5% on the balance.	1% on first Rs.10,00,000/- + ½% on the next Rs.10,00,000/- + ¼% on the balance.

Scale of S.D. recovery.

(h) Balance Security for Contract of supplying materials and equipment computed in terms of the percentages given above, shall have to be deposited with the Trustees' Treasurer in advance and within 30 days from the date of placement of supply order, either in cash or by A/c. Payee Draft of a Nationalized Bank of India drawn in favour of Calcutta Port Trust and payable at Calcutta/Haldia, as the case may be.

S.D. for supply contracts to be deposited in advance.

(i) No interest shall be paid by the Trustees to the Tenderer/Contractor on the amount of Earnest Money/Security Deposit held by the Trustees, at any stage.

No interest payable on E.M. /S.D

3.5 (i) The Security Deposit shall be refunded to the Contractor in terms of Clause 9.3 hereinafter and subject to deduction, if any, under the provision of Sub-clause 3.5 (ii) herein below. However, the Contract provides for any maintenance period. 50% of the Security Deposit may be refunded against any of the treasury Receipt for that amount on expiry of half of the maintenance period and the balance deposit on the expiry of the said maintenance period and after the Engineer has certified the final completion of work in Form G.C.2 and the Contractor has submitted his "No Claim" Certificate in Form G.C.3.

Mode of refund of S.D.

(ii) The Security Deposit/Earnest Money may be liable to forfeiture at the option of the Trustees, if the Contractor fails to carry out the work or to perform/observe any of the conditions of the Contract. The Trustees shall also be at liberty to deduct any of their dues from the Security Deposit,

Forfeiture of S.D.

fixed Security, Earnest Money or from any sum due or to become due to the Contractor under any other contract.

3.6 If stipulated in the contract as a Special Condition, the contractor shall have to submit to the Engineer a performance Bond in the form of an irrevocable guarantee from Calcutta/Haldia Branch, as the case may be, of any Nationalised Bank of India in the proforma annexed hereto and for the sum and period as mentioned in the letter of acceptance of the Tender/Offer, within 15 days from the date of such letter, failing which the Contract shall be liable to be terminated and the earnest money shall be liable to forfeiture; all at the discretion of the Engineer. The cost of obtaining this or any other Bank Guarantee and/or the revalidation thereof, wherever required, has to be borne by the Contractor and it shall be his sole responsibility to arrange for timely revalidation of such Bank Guarantee, failing which and for non-fulfilment of any contractual obligation by the Contractor, the Engineer and/or the Trustees shall be at liberty to raise claim against the Guarantee and/or enforce the same unilaterally.

Bank Guarantee in lieu of Cash S.D. in certain cases

3.7 "Every Tenderer/ Bidder shall submit, in respect of a tender value of more than Rs 5 Crore, along with their tender comprising Special Conditions of Contract, General Conditions of Contract, BOQ, Earnest Money, etc. a document called Integrity Pact Agreement duly signed by their authorized representative. The Proforma of the Integrity Pact Agreement shall be as specified in the GCC. In case of tender value more than Rs 5 Crore, the Integrity Pact Agreement is an essential part and parcel of bid document to be submitted by each tenderer, without which the tender shall not be considered."

4.0 THE CONTRACT & GENERAL OBLIGATIONS OF CONTRACTOR

4.1 (a) The contract documents shall be drawn-up in English language.

English language to be used

(b) The contract shall be governed by all relevant Indian Acts. As applicable only within the jurisdiction of the High Court at Calcutta, India, including the following Acts:

1. The Contract Act (India), 1872.
2. The Major Port Trusts Act, 1963.
3. The Workmen's Compensation Act, 1923.
4. The Minimum Wages Act, 1948.
5. The Contract Labour (Regulation & Abolition) Act,1970.
6. The Dock Workers' Act,1948.
7. The Arbitration and Conciliation Act (1996) (in the case of a definite Arbitration Agreement only).

Applicability of laws on the contract

4.2 After acceptance of his Tender/Offer and when called on to do so by the engineer or his representative, the contractor shall, at his own expense, enter into and execute a Contract Agreement to be prepared by him in the form annexed hereto. Until such Contract Agreement is executed, the other documents referred to in the definition of the term 'Contract' here-in-before, shall collectively be the Contract.

Contractor to Execute Contract Agreement.

4.3 Several documents forming the contract are to be taken as mutually explanatory of one another. Should there by any discrepancy, ambiguity, omission or error in the various contract documents, the Engineer shall have the power to correct the same and his decision shall be final and binding on the parties to the Contract.

Interpretation of contract documents –Engineers' Power

4.4	**Two copies of the Drawings referred to in the general and special Conditions of Contract and in the Bill of Quantities, shall be furnished by the Engineer to the Contractors free of cost for his use on the work, but these shall remain the property of the Trustees and hence, the Contractor shall return them to the Engineer or his Representative on completion of the work, if not torn or mutilated on being regularly used at site.**	**All Drawings are Trustees' property.**
4.5	**The Contractor shall prove and make at his own expense any working or progress drawings required by him or necessary for the proper execution of the works and shall, when required, furnish copies of the same free of cost to the Engineer for his information and/or approval, without meaning thereby the shifting of Contractor's responsibility on the Engineer in any way whatsoever.**	**Contractor to prepare working / progress drawings**
4.6	**The Contractor shall not directly or indirectly transfer, assign or sublet the Contract or any part thereof without the written permission of the Engineer. Even if such permission be granted, the Contractor shall remain responsible (a) for the acts, defaults and neglect of any sub-contractor, his agents, servants or workmen as fully as if these were the acts, defaults or neglects of the Contractor himself or his agents, servants or workmen and (b) for his full and entire responsibility of the contract and for active superintendence of the works by him despite being sublet, provided always that the provision of labourers on a "piece rate" basis shall not be deemed to be sub-letting under this clause.**	**Contractor cannot sub-let the work**
4.7	**Unless otherwise specified, the Contractor shall be deemed to have included in his Tender/Offer all his cost for supplying and providing all constructional plant, temporary work. Materials both for temporary and permanent works, labour including supervision thereof, transporting to and from the site and in and about the work, including loading, unloading, fencing, watching, lighting, payment of fees, taxes and duties to the appropriate authorities and other things of every kind required for the construction, erection, completion and maintenance of the work.**	**Contractors' price is inclusive of all costs**
4.8	**The Contractor shall be solely responsible for the adequacy, stability and safety of all site operations and methods of construction, even if any prior approval thereto has been taken from the Engineer or his Representative. The Contractor shall not be responsible for the correctness of the design or specification of the Temporary and Permanent works formulated by the Engineer; but the Contractor shall be fully responsible for the correct implementation thereof, as also for any design and specification prepared/proposed/used by the Contractor.**	**Contractor is responsible for all construction process, except for correctness of design and specification formulated by the Engineer**
4.9	**Whenever required by the Engineer or his representative, the Contractor shall submit to him the details of his (a) programme for execution of the work, (b) proposed procedure and methods of work, (c) proposed deployment of plant, equipment, labour, materials and temporary works. The submission to and/or any approval by the Engineer or his Representative to any such programme or particulars shall not relieve the Contractor of any of his obligations under the contract.**	**Contractor to submit his programme of work**

If for any reason the contractor be unable to adhere to his earlier programme, he shall submit his revised programme for completion of work within the stipulated time whenever asked to do so.

4.10	**Necessary and adequate supervision shall be provided by the Contractor during execution of the works and as long thereafter as the Engineer or his representative shall consider necessary during the maintenance period. The Contractor or his competent and authorised agent or representative shall be constantly at site and instructions given to him by the Engineer or his representative in writing shall be binding upon the Contractor subject to limitation in Clause 2.5 hereof. The Contractor shall inform the Engineer or his representative in writing about such representative/agent of him at site.**	**Contractor to supervise the works**
4.11	**The Contractor shall employ in execution of the Contract only qualified careful and experienced persons and the Engineer shall be at liberty to direct the Contractor to stop deployment of any of is staff, workmen or official at site and the Contractor shall within 48 hours comply with such instruction without any demur whenever the Engineer shall feel that the deployment of the person concerned will not be conducive to the proper and timely completion of the work.**	**Contractor to deploy qualified men and Engineer's power to remove Contractor's men**
4.12	**The Contractor shall be responsible for the true and proper setting out of the works in relation to reference points/lines/levels given by the Engineer in writing. The checking of any setting-out or of any alignment or level by the Engineer or his Representative shall not in any way relieve the contractor of his responsibility for the correctness thereof and he shall fully provide protect and preserve all stakes, templates, bench marks, sight rails, pegs, level marks, profile marks and other things used in setting out the works.**	**Contractor is responsible for line, level, setting out etc.**
4.13	**From the commencement of the works till issue of the completion certificate in Form G.C.1, vide Clause 5.12 hereof, the contractor shall take full responsibility for the care thereof. Save for the excepted risks, any damage, loss or injury to the work or any part thereof shall be made good by the Contractor at his own cost as per instruction and to the satisfaction of the engineer, failing which the Engineer or his Representative may cause the same to be made good by any other agency and the expenses incurred and certified by the Engineer shall deem proper. This Clause will not apply to that part of the work, which might have been taken over by the Trustees on partial completion of the work and in such case the Contractor's obligation will be limited to repairs and replacement for manufacturing or construction defects during the Maintenance period (Guarantee Period) as per the directions of the Engineer as also for defects/damages if any caused to the work by the Contractor during such repairs and replacement in the maintenance period.**	**Contractor is responsible to protect the work**

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4.14 **The Contractor shall at his own cost protect support and take all precautions in regard to the personnel or structure or services or properties belonging to the Trustees or not which may be interfered with or affected or disturbed or endangered and shall indemnify and keep indemnified the Trustees against claim for injury, loss or damage caused by the Contractor in connection with the execution and maintenance of the work to the aforesaid properties, structures and services and/or to any person including the Contractor's workmen. Cost of Insurance Cover, if any, taken by the Contractor shall not be reimbursed by the Trustees, unless otherwise stipulated in the Contract.**

Contractor is responsible for all damages to other structures / persons caused by him in executing the work.

4.15 **The Contractor shall immediately inform the Engineer's Representatives if any fossil, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological importance be discovered at site which shall remain the property of the Trustees and protect them from being damaged by his workmen and arrange for disposal of them at the Trustees' expense as per the instruction of the Engineer's Representative.**

Fossils, Treasure travois, etc. are Trustees' property

4.16 **The Contractor shall be deemed to have indemnified and shall indemnify the Trustees against all claims, demands, actions and proceedings and all costs arising therefrom on account of:**

(a) Infringement of any patent right, design, trademark or name or other protected right in connection with the works or temporary work.

(b) Payment of all royalties, rent, toll charges, local taxes, other payments or compensation, if any, for getting all materials and equipment required for the work.

(c) Unauthorised obstruction or nuisance caused by the contractor in respect of Public or Private or Private road, railway tracks, footpaths, crane tracks, waterways, quays and other properties belonging to the Trustees or any other person.

(d) Damage/injury caused to any highway and bridge on account of the movement of Contractor's plants and materials in connection with the work.

(e) Pollution of waterway and damage caused to river, lock, sea-wall or other structure related to waterway, in transporting contractor's plants and materials.

(f) The Contractor's default in affording all reasonable facilities and accommodation as per the direction of the Engineer or his Representative to the workmen of the Trustees and other agencies employed by or with the permission and/or knowledge of the Trustees on or near the site of work.

Contractor to Indemnify the Trustees against all claims for loss, damage, etc.

4.17 **Debris and materials, if obtained by demolishing any property, building or structure in terms of the Contract shall remain the property of the Trustees.**

Dismantled materials Trustees' property

4.18 **The Contractor's quoted rates shall be deemed to have been inclusive of the following:**

Contractor's quoted rates/price must be all inclusive

(a) Keeping the site free of unnecessary obstruction and removal from site of constructional plant wreckage, rubbish, surplus earth or temporary works no longer required.

(b) Cleaning and removal from site all the surplus materials of every kind to leave the site clean and tidy after completion of the work, without which payment against final bill may be liable to be withheld.

(c) Precautionary measures to secure efficient protection of Docks, the River Hooghly and other waterways against pollution of whatever nature during execution and maintenance of the works and to prevent rubbish, refuse and other materials from being thrown into the water by the Contractor's men or those of his agency.

(d) Making arrangements for deployment of all labourer and workers, local or otherwise including payment for their wages, transport, accommodation, medical and all other statutory benefits and entry permits, wherever necessary.

(e) Making arrangements in or around the site, as per the requirements of local authority or the Engineer or his Representative for preventing (i) spread of any infectious disease like smallpox, cholera, plague or malaria by taking effective actions for destruction of rats, mice, vermin, mosquitoes, etc. and by maintaining healthy and sanitary condition, (ii) illegal storage and distribution of Drugs, Narcotics, Alcoholic liquor, Arms and Ammunitions, (iii) unlawful, riotous or disorderly conduct of the Contractor's or his Sub-Contractor's workmen, (iv) deployment of workmen of age less than 16 years.

4.19 **Every direction or notice to be given to the Contractor shall be deemed to have been duly served on or received by the Contractor, if the same is posted or sent by hand to the address given in the tender or to the Contractor's Site Office or to the Registered Office of the Contractor. The time mentioned in these conditions for doing any act after direction or notice shall be reckoned from the time of such posting or despatch.**

Notice to Contractor.

4.20 **The Contractor and his Sub-contractor or their agents and men and any firm supplying plant, materials and equipment shall not publish or caused to be published any photographs or description of the works without the prior authority of the Engineer in writing.**

Contractor not to publish photograph or particulars of work

4.21	**The Contractor shall at the Trustees' cost to be decided by the Engineer render all reasonable facilities and Co-operation as per direction of the Engineer or his representative to any other Contractor engaged by the Trustees and their workmen to the Trustees' own staff and to the men of other Public Body on or near the site of work and in default the Contractor shall be liable to the Trustees for any delay or expense incurred by reason of such default.**	**Contractor to provide facilities to outsiders**
4.22	**The work has to be carried out by the Contractor causing the minimum of hindrance for any maritime traffic or surface traffic.**	**Work to cause minimum possible hindrance to traffic movement**
4.23	**All constructional plants, temporary works and materials when brought to the site by the Contractor shall be deemed to be the property of the Trustees who will have lien on the same until the satisfactory completion of the work and shall only be removed from the site in part or in full with the written permission of the Engineer or his Representative.**	**Trustees' lien on Contractor's Plant & Equipment.**
5.0	**COMMENCEMENT, EXECUTION AND COMPLETION OF WORK.**	
5.1	**The Contractor shall commence the work within 7 days of the receipt of Engineer's letter informing acceptance of the Contractor's tender/offer by the Trustees or within such preliminary time as mentioned by the Contractor in the Form of Tender or the time accepted by the Trustees. The Contractor shall then proceed with the work with due expedition and without delay, except as may be expressly sanctioned or ordered by the Engineer or his Representatives, time being deemed the essence of the contract on the part of the contractor.**	**Preliminary time to commence work an maintenance of steady rate of progress**
5.2	**The Contractor shall provide and maintain a suitable office at or near the site to which the Engineer's Representative may send communications and instructions for use of the Contractor.**	**Contractor's site office**
5.3	**Unless specified otherwise in the contract or prior permission of the Engineer has been taken, the contractor shall not execute the work beyond the working hours observed by the Engineer's Representative and on Sundays and Holidays observed in the Trustees' system, except in so far as it becomes essential on account of tidal work or for safety of the work. If the progress of the work lags behind schedule or the work has been endangered by any act or neglect on the part of the contractor, then the Engineer or his Representative shall order and the contractor at his own expense shall work by day and by night and on Sundays and Public Holidays. Any failure of the Engineer or his Representative to pass such an order shall not relieve the contractor from any of his obligations. The Engineer's decision in this regard shall be final binding and conclusive.**	**Contractor to observe Trustees' working hours**

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5.4	**Unless stipulated otherwise in the contract all materials required for the work shall be procured and supplied by the contractor with the approval of the Engineer or his Representative and subject to subsequent testing as may be required by the Engineer or his Representative. The Engineer shall exercise his sole discretion to accept any such materials.**	**Contractor to supply all materials as per requirement of the Engineer or his representative**
5.5	**Unless stipulated otherwise in the contract all materials, workmanship and method of measurement shall be in accordance with the relevant Codes (Latest Revision) of the Bureau of Indian Standards and the written instructions of the Engineer or his Representative. Where no specific reference is available in the contract, the material and workmanship shall be of the best of their respective kinds to the satisfaction of the Engineer.**	**Materials & Works**
5.6	**Samples shall be prepared and submitted for approval of the Engineer or his representative, whenever required to do so, all at the Contractor's cost.**	**Contractor to submit samples for approval**
5.7	**Unless stipulated otherwise in the contract, the cost of any test required by the Engineer or his representative in respect of materials and workmanship deployed on the work, shall be borne by the Contractor.**	**Contractor to arrange all testing at his own cost.**
5.8	**Regarding the supply of any materials by the Trustees to the contractor in accordance with the contract, the following conditions shall apply :**	
	(a) The Contractor shall, at his own expense, arrange for transporting the materials from the Trustees' Stores, watching, storing and keeping them in his safe custody, furnishing of statement of consumption thereof in the manner required by the Engineer or his representative, return of surplus and empty container to the Trustees' Stores as per the direction of the Engineer or his Representative.	**The Contractor shall account for and look after the Trustees' materials**
	(b) Being the custodian of the Trustees' materials, the contractor shall remain solely responsible for any such materials issued to him and for any loss or damage thereof for any reason other than "Excepted Risks", the Contractor shall compensate the Trustees' in the manner decided by the Engineer and shall at no stage remove or cause to be removed any such material from the site without his permission in writing.	**Contractor to compensate for loss and damage to Trustees' materials**
	(c) The Trustees' materials will generally be supplied in stages and in accordance with the rate of progress of work but except for grant of suitable extension of completion time of work as decided by the Engineer. The Contractor shall not be entitled to any other compensation, monetary or otherwise, for any delay in the supply of Trustees' materials to him. The Contractor shall, however, communicate his requirement of such materials to the Engineer from time to time.	**Delay in supply of Trustees' materials will only entitle the Contractor for extension of completion time of work**

(d) Unless stipulated otherwise in the contract, the value of the Trustees' materials issued to the contractor shall be recovered from the contractor's bills and/or any of his other dues, progressively according to the consumption thereof on the work and/or in the manner decided by the Engineer or his representative and at the rate/s stipulated in the contract. These rates shall only be considered by the contractor in the preparation of his tender/offer and these will form the basis of escalation/variation, if in future the contractor is required to procure and provide any such material on the written order of the Engineer consequent on the Trustees' failure to effect timely supply thereof.

Recovery from Contractor for Trustees' materials under normal circumstances

(e) If the Engineer decides that due to the contractor's negligence, any of the Trustees' materials issued to the contractor has been – (i) lost or damaged, (ii) consumed in excess of requirement and (iii) wasted by the contractor in excess of normal wastage, then the value thereof shall be recovered from the contractor's bills or from any of his other dues, after adding 19 ¼% extra over the higher one of the followings -

Recovery from Contractor for Trustees' materials under other circumstances.

(1) The issue rate of the materials at the Trustees' Stores and

(2) The market price of the material on the date of issue as would be determined by the Engineer.

5.9 The Engineer or his Representative shall have the power to insect any material and work at any time and to order at any time – (I) for removal from the site of any material which in his opinion is not in accordance with the contract or the instruction of the engineer or his representative, (ii) for the substitution of the proper and suitable materials, or (iii) the removal and proper re-execution of any work which in respect of material and workmanship is not in accordance with the contract or the instructions of the Engineer. The Contractor shall comply with such order at his own expense and within the time specified in the order. If the contractor fails to comply, the Engineer shall be at liberty to dispose any such materials and re-do any work in the manner convenient to the Trustees by engaging any outside agency at the risk and expense of the contractor and after giving him a written prior notice of 7 days.

Contractor to replace materials/work not acceptable to the Engineer or his Representative

5.10 No work shall be covered up and put out of view by the contractor without approval of the Engineer or his Representative and whenever required by him, the contractor shall uncover any part or parts of the work or make openings in or through the same as may be directed by the Engineer or his representative from time to time and shall reinstate or make good those part of works thus affected to the satisfaction of the Engineer, all at the cost of the contractor.

The Trustees shall reimburse such cost as determined by the Engineer, if the initial covering up was with prior written order of the Engineer or his Representative.

Contractor to seek approval of Engineer or his Representative before covering up any portion of work

5.11 **On a written order of the Engineer or his Representative, the contractor shall delay or suspend the progress of the work till such time the written order to resume the execution is received by him. During such suspension the contractor shall protect and secure the work to the satisfaction of the Engineer or his Representative. All extra expenses in giving effect to such order shall be considered by the Trustees, unless such suspension is –**

Contractor to suspend work on Order from Engineer or his Representative

(a) otherwise provided for in the contract, or

(b) necessary by reason of some default on the part of the contractor, or

(c) necessary by reason of climatic conditions on the site, or

(d) necessary for proper execution of the works or for the safety of the works or any part thereof.

The Engineer shall settle and determine such extra payment and/or Extension of completion time to be allowed to the contractor, as shall, in the opinion of the Engineer be fair and reasonable, and the same shall be final and binding on the Contractor.

5.11. If at any time before or after commencement of the work the Trustees do not require the whole of the work tendered for the Engineer shall notify the same to the contractor in writing and the contractor shall stop further works in compliance of the same. The Contractor shall not be entitled to any claim for compensation for underived profit or for such premature stoppage of work or on account of curtailment of the originally intended work by reason of alteration made by the Engineer in the original specifications, drawings, designs and instructions.

5.12 **When the whole of the work has been completed to the satisfaction of the Engineer and has passed any final test prescribed in the contract, the contractor shall, within 21 days of submission of his application to the Engineer, be entitled to receive from him a certificate for completion of work in Form G.C.1, annexed hereto. If any part of the total work having been completed to the satisfaction of the Engineer, be taken over and/or used by the Trustees, the Contractor shall on application be entitled to partial completion certificate in the Form G.C.1 indicating the portion of the work covered by it, so that the Contractor's liability during maintenance period of the contract, if any, shall commence from the date mentioned in such certificate so far as the completed portion of the work is concerned.**

Completion Certificate G.C.1.

6.0 TERMS OF PAYMENT:

6.1	**No sum shall be considered as earned by or due to the Contractor in respect of the work till final and satisfactory completion thereof and until a certificate of final completion in Form G.C.2 has been given by the Engineer.** **On account payments, if any, made prior to issue of the certificate in Form G.C.2, shall all be treated as mere advance, which shall stand recoverable in full or in part, if the Engineer so decides in the context of Contractor's unfulfilled contract condition, if any.**	**All interim payments are advances till issue of Certificate in Form G.C.2**
6.2	**All payments shall be made to the Contractor only on the basis of measurements of actual work done, as recorded in the Trustees' measurement books and at accepted tendered or at agreed rates, as the case may be, except as otherwise provided in the contract and when the Engineer decides any other rate for change in the scope of work or omission, if any, on the part of the Contractor.**	**Payment on the basis of measurements at agreed rates.**
6.3	**For work of sanctioned tender value more than Rs.50,000/- or having an initially stipulated completion period of 4 months or more, on account payments may be made sat the discretion of the Engineer or his Representative at intervals deemed suitable and justified by him. Provided always that subject to execution of work of substantial value in the context of the contract price, the interval of such on-account payments shall be decided by the Engineer or his Representative, which shall ordinarily not be less than 1 month in between two payments for on account bill and/or advance.**	**Limitation for on account payment**
6.4	**Measurement for works done shall be progressively taken by the Engineer's Representative and entered in the Trustees' Measurement Book, at intervals deemed suitable and proper by him and/or the Engineer. The Contractor or his duly accredited Representative or Agent shall remain present at the time of such measurement and assist the engineer's Representative in every manner required by him. After the measurements taken have been entered in the Measurement Book, the Contractor or his Agent shall sign the Measurement Book at the wend of such Measurements over the Contractor's Rubber Stamp as a token of acceptance of all such measurements, recorded above and prior to such signature. If the Contractor or his Agent fails to participate even after 3 days written notice from the Engineer's Representative, the measurement shall be taken ex-parte by the Engineer's Representative and those shall be accepted by the Contractor.**	**Recording of measurements**

GC – 19

Contractor to prepare and submit his bills

6.5 **Based on the quantum of work and the value thereof computed in the Measurement Book, the Contractor shall type out his bill in the proforma approved by the Engineer and submit the same to the Engineer's Representative in quadruplicate, duly signed by him or his accredited Agent over his Rubber Stamp. The Engineer or his Representative may in his absolute discretion, allow advance payment against such bill to the extent of an amount not exceeding 75% of the "net payable" sum of the said bill, subject to adjustment thereof against the bill at the time of checking and auditing the bill at the Trustees' end. The measurement Book will not be handed over to the Contractor; but he will obtain the abstracts of quantities, amounts and recoveries to type out the bill.**

6.6 **At the discretion of the Engineer or his Representative and only in respect of accepted offers/where estimated amount put to tender would be Rs.2,00,000/- or more, advance payment may be made to the extent of 75% of the value of any material purchased and brought to the site by the Contractor. Provided always that –**

Advance payment against Non-perishable materials

(i) **the materials shall, in the opinion of the Engineer or his Representative be of imperishable nature,**

(ii) **the value of such materials shall be assessed by the engineer or his Representative at their own discretion,**

(iii) **a formal agreement has been drawn up with the contractor, under which the Trustees secure a lien on the contractor's materials,**

(iv) **the materials are safe-guarded by the contractor against losses, shortage and misuse due to the contractor postponing the execution of the work or otherwise,**

(v) **in the event of storage of such materials within the Trustees' protected areas in the Docks, the contractor shall submit an Indemnity Bond in the proforma and manner acceptable to Trustees' whereby the contractor shall indemnify the Trustees against all financial loss/damage, on account of loss/damage to such materials for whatever reasons,**

(ii) **in the event of storage of such materials outside the Trustees' protected areas the Contractor shall submit to the Engineer an irrevocable Bank Guarantee favouring the Trustees and for the same sum as is being advance, in the proforma and manner acceptable to the Trustees. The Guarantee shall be of a Calcutta/Haldia Branch of any Nationalised Bank or a Schedule Commercial Bank, as the case may be, acceptable to the Trustees and shall remain valid till the anticipated period of consumption of such materials in the work. The Bank Guarantee must bear an undertaking by the issuing Bank guaranteeing automatic payment of the guaranteed sum to the Trustees by the Bank on the date of expiry of the validity of the Guarantee, unless with the prior written approval of the Engineer on behalf of the Trustees, the Bank has extended the validity of the Guarantee.**

(iii) **The amount of advance shall be recoverable from the contractor's bills or any other dues, progressively with the consumption of the materials on the basis of quantity consumed. Consequent on full recovery of the advance the Indemnity Bond/Bank Guarantee, vide Sub-clause (v) & (vi) above, shall be returned to the Contractor duly discharged by the Engineer on behalf of the Trustees.**

6.7 **No certificate of the Engineer or his representative shall protect the Contractor against or prevent the Trustees from obtaining repayment from the Contractor, in case the Engineer or his representative should over-certify for payment or the Trustees should over-pay the Contractor on any account.**

Recovery for wrong and over payment

6.8 **No claim for interest shall be admissible or payable to the Contractor at any stage and in respect of any money or balance or Bank Guarantee, which may be due to the Contractor from the Trustees, owing to dispute or otherwise or for any delay on the part of the Trustees in making interim or final payment or otherwise.**

Interest not admissible to Contractor

7.0 **VARIATION AND ITS VALUATION:**

7.1 **The Quantities set out in the Bill of Quantities of the tender shall be treated as estimated quantities of the work and shall never be deemed as actual or correct quantities of the works to be executed by the contractor in fulfilment of his obligation under the contract.**

Quantities in Bill of Quantities of Tender

7.2 **The Engineer shall have the power to order the Contractor in writing to make any variation of the quantity, quality or form of the works or any part thereof that may, in his opinion, be necessary and the Contractor upon receipt of such an order shall act as follows:**

Engineer's power to vary the works

7.2 **(a) Increase or decrease the quantity of any work included in the contract.**

(b) Omit any work included in the contract.

(c) Change the Character or quality or kind of any work included in the contract.

(d) Change the levels, lines, position and dimensions of any part of the work, and

(e) Execute extra and additional work of any kind necessary for completion of the works

7.3 **No such variation shall in any way vitiate or invalidate the contract or be treated ass revocation of the contract, but the value (if any) of all such variations evaluated in accordance with the Engineer's sole decision shall be taken into account and the contract price shall be varied accordingly.**

Variation by engineer do not vitiate the contract

7.4 **Provided always that written order of the Engineer shall not be required for increase or decrease in the quantity of any work upto 15% where such increase or decrease is not the result of any variation order given under this clause but is the result of the quantities exceeding or being less than those stated in the bill of quantities. Provided also that verbal order of variation from the Engineer shall be complied with by the Contractor and the Engineer'' subsequent written confirmation of such verbal order shall be deemed to be an order in writing within the meaning of this clause.**

Where written order for variation is not needed

7.5 **(a) The Contractor shall not be entitled to any claim of extra or additional work unless they have been carried out under the written orders of the Engineer.**

(b) The Engineer shall solely determine the amount (if any) to be added to or deducted from the sum named in the tender in respect of any extra work done or work omitted by his order.

(c) All extra, additional or substituted work done or work omitted by order of the Engineer shall be valued on the basis of the rates ad prices set out in the contract, if in the opinion of the Engineer, the same shall be applicable. If the contract does not contain any rates or prices directly applicable to the extra, additional or substituted work, then the Engineer may decide the suitable rates on the basis of Schedule of Rates (including surcharge in force at the time of acceptance of tender), if any, adopted by the Trustees with due regard to the accepted contractual percentage, if any thereon. In all other cases the Engineer shall solely determine suitable rates in the manner deemed by him as fair and reasonable, and his decision shall be final, binding and conclusive.

Payment for extra or additional, or omitted work or substituted work, Engineer's powers

(d) If the nature or amount of any omission or addition relative to the nature or amount of the whole of the contract work or to any part thereof shall be such that, in the opinion of the Engineer, the rate of prices contained in the contract for any item of the works or the rate as evaluated under sub-clauses (b) and (c) of this clause, is by reason of such omission or addition rendered unreasonable or in-applicable, the Engineer shall fix such other rate or price as he deems proper and the Engineer's decision shall be final, binding and conclusive.

8.0 DELAY / EXTENSION OF COMPLETION TIME / LIQUIDATED DAMAGE / TERMINATION OF CONTRACT

Extension of completion time

8.1 Should the quantum of extra or additional work of any kind or delayed availability of the Trustees' materials to be supplied as per contract or exceptionally adverse climatic conditions and natural phenomenon or strikes, lock-outs, civil commotion or other special circumstances of any kind beyond the control of the Contractor, cause delay in completing the work, the contractor shall apply to the Engineer in writing for suitable extension of completion time within 7 days from the date of occurrence of the reason and the Engineer shall thereupon consider the stated reasons in the manner deemed necessary and shall either reject the application or determine and allow in writing the extension period as he would deem proper for completion of the work with or without the imposition of "Liquidated Damage" Clause (No.8.3 hereof) on the Contractor and his decision shall be final and binding on the Contractor. If an extension of completion time is granted by the Engineer without imposition of liquidated damage, from the Clause No.8.3 of the Liquidated damage shall apply from its date of expiry, if the work be not completed within the extended time, unless stated otherwise in the decision communicated by the Engineer, as aforesaid.

'Liquidated Damage' and other compensation due to Trustees

8.2 a) If the Contractor fails to complete the work within the stipulated dates or such extension thereof as communicated by the Engineer in writing, the Contractor shall pay as compensation (Liquidated Damage) to the Trustees and not as a penalty, ½% (half percent) of the total value of work (contract piece) as mentioned in the letter of acceptance of the tender/offer, for every week or part thereof the work remains unfinished. Provided always that the amount of such compensation shall not exceed 10% of the said value of work. The amount of Liquidated damages shall be determined by the Engineer, which shall be final and binding.

(b) Without prejudice to any of their legal rights, the Trustees shall have the power to recover the said amount of compensation/damage in Sub-clause (a) of this clause, from any money due or likely to become due to the Contractor. The payment or deduction of such compensation/damage shall not relieve the Contractor from his obligation to complete the work or from any of his other obligations/liabilities under the contract and in case of the Contractor's failure and at the absolute discretion of the Engineer, the work may be ordered to be completed by some other agency at the risk and expense of the Contractor, after a minimum three days notice in writing has been given to the Contractor by the Engineer or his Representative.

8.3 Without being liable for any compensation to the Contractor, the Trustees may, in their absolute discretion, terminate the contract and enter upon the site and works and expel the Contractor there from after giving him a minimum 3 days' notice in writing, due to occurrence of any of the following reasons and decision of the Trustees in this respect, as communicated by the Engineer shall be final and conclusive :

Default of the Contractors remedies & powers/Termination of Contract.

(i) The Contractor has abandoned the contract.

(ii) In the opinion of the Engineer, either the progress of work is not satisfactory or the work is not likely to be completed within the agreed period on account of Contractor's lapses.

(iii) The Contractor has failed to commence the works or has without any lawful excuse under these conditions has kept the work suspended for at least 15 days despite receiving the Engineer'' or his Representative'' written notice to proceed with the work.

(iv) The Contractor has failed to remove materials from site or to dismantle or demolish and replace work for 7 days after receiving from the Engineer or his representative the written notice stating that the said materials or work were condemned and rejected by him under these conditions.

(v) The Contractor is not executing the works in accordance with the contract or is persistently or flagrantly neglecting to carry out his obligations under the contract.

(vi) Any bribe, commission, gift or advantage is given, promised or offered by or on behalf of the contractor t any officer, servant or representative of the Trustees or to any person on his or their behalf in relation to the obtaining or to the execution of the contract.

(vii) The Contractor is adjusted insolvent or enters into composition with his creditors or being a company goes into liquidation either compulsory or voluntary.

8.3.1 **Upon receipt of the letter of termination of work, which may be issued by the Engineer on behalf of the Trustees, the Contractor shall hand over all the Trustees' tools, plant and materials issued to him at the place to be ascertained from the Engineer, within 7 days of receipt of such letter.**

8.3.2 **In all such cases of Termination of work, the Trustees shall have the power to complete the work through any other agency at the Contractor's risk and expense and the Contractor shall be debited any sum or sums that may be expended in completing the work beyond the amount that would have been due to the Contractor, had he duly completed the work of the work in accordance with the contract.**

8.3.3 **Upon termination of contract, the Contractor shall be entitled to receipt payment of only 90% of the value of work actually done or materials actually supplied by him and subject to recoveries as per contract, provided the work done and materials conform to specifications at the time of taking over by the Trustees. The payment for work shall be based on measurements of actual work done and priced at approved contract rates or other rates, as decided by the Engineer. The payment for materials supplied shall be at the rates as decided by the Engineer, which shall I in no case be more than market rates prevailing at the time of taking over by the Trustees. The Engineer's decision in all such case shall be final, binding and conclusive.**

8.3.4 **The Trustees shall have the power to retain all moneys due to the Contractor until the work is completed by other agency and the Contractor's liabilities to the Trustees are known in all respect.**

9.0 **MAINTENANCE AND REFUND OF SECURITY DEPOSIT**

9.1 **On completion of execution of the work the Contractor shall maintain the same for a period, as may be specified in the form of a Special Condition of the Contract, from the date mentioned in the Initial Completion Certificate in Form G.C.1. Any defect/fault, which may appear in the work during aforesaid maintenance period, arising, in the sole opinion of the Engineer or his representative, from materials or workmanship not in accordance with the contract or the instruction of the Engineer or his representative, shall, upon the written notice of the Engineer or his representative, be amended and made good by the Contractor at his own cost within seven days of the date of such notice, to the satisfaction of the Engineer or his representative, failing which the Engineer or his representative shall have the defects amended and made good through other agency at the Contractor's risk and cost and all expenses, consequent thereon or incidental thereto, shall be recoverable from the Contractor in any manner deemed suitable by the Engineer.**

Contractor's obligation for maintenance of work.

9.2	The Contractor shall not be considered completed and the work shall not be treated as finally accepted by the Trustees, until a Final Completion Certificate in Form G.C.2 annexed hereto shall have been signed and issued by the Engineer to the contractor after all obligations under the Contract including that in the maintenance period, if any, have been fulfilled by the Contractor. Previous entry on the works or taking possession, working o using thereof by the Trustees shall not relieve the Contractor of his obligations under the contract for full and final completion of the work.	Certificate of final completion
9.3	On completion of the contract in the manner aforesaid, the Contractor may apply for the refund of his Security Deposit by submitting o the Engineer (I) The Treasury Receipts granted for the amount of Security held by the Trustees, and (ii) his "No further claim" Certificate in Form G.C.3 annexed hereto (in original), where upon the Engineer shall issue Certificate in Form G.C.2 and within two months of the Engineer's recommendation, the Trustees shall refund the balance due against the Security Deposit to the Contractor, after making deduction therefrom in respect of any sum due to the Trustees from the Contractor.	Refund of Security Deposit
10.0	INTERPRETATION OF CONTRACT DOCUMENTS, DISPUTES AND ARBITRATION	
10.1	In all disputes, matters, claims, demands or questions arising out of or connected with the interpretation of the Contract including the meaning of Specifications, drawings, designs and instructions or as to the quality of workmanship or as to the materials used in the work or the execution of the work whether during the progress of the works or after the completion and whether before or after the determination, abandonment or breach of the contract the decision of the Engineer shall be final and binding on all parties to the contract and shall forthwith be given effect to by the Contractor.	Engineer's decision
10.2	If the Contractor be dissatisfied with any such decision of the Engineer, he shall within 15 days after receiving notice of such decision require that the matter shall be referred to Chairman, who shall thereupon consider and give a decision.	Chairman's award.
10.3	If, however, the Contractor be still dissatisfied with the decision of the Chairman, he shall within 15 days after receiving notice of such decision require that within 60 days from his written notice, the Chairman shall refer the matter to an Arbitrator of the panel of Arbitrators to be maintained by the Trustees for the purpose and any such reference shall be deemed to be a submission to arbitration within the meaning of Indian Arbitration Act, 1940 or any statutory modification thereof.	Arbitration.
10.3.1.	If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever, another person from panel shall be appointed as Sole Arbitrator and he shall proceed from the stage at which his predecessor left it.	

10.3.2 **The Arbitrator shall be deemed to have entered on reference on the date he issues notice to both the parties fixing the date of first hearing.**

10.3.3 **The time limit within which the Arbitrator shall submit his award shall normally be 4 months as provided in Indian Arbitration Act, 1940 or any amendment thereof. The Arbitrator may, if found necessary, enlarge the time for making and publishing the award, with the consent of the parties.**

10.3.4 **The venue of the arbitration shall be either Calcutta or Haldia as may be fixed by the Arbitrator in his sole discretion. Upon every or any such reference the cost of any incidental to the reference and award respectively shall be in the discretion of the Arbitrator who may determine, the amount thereof or by whom and to whom and in what manner the same shall be borne and paid.**

10.3.5 **The Award of the Arbitrator shall be final and binding on all parties subject to the provisions of the Indian Arbitration Act 1940 or any amendment thereof. The Arbitrator shall give a separate award in respect of each item of disputes and respective claim referred to him by each party and give reason for the award.**

10.3.6 **The Arbitrator shall consider the claims of all the parties to the contract – within only the parameters of scope and conditions of the contract in question.**

10.3.7 **Save as otherwise provided in the contract the provisions of the Arbitration Act, 1940 and rules made thereunder, for the time being in force, shall apply to the arbitration proceedings under this Clause.**

10.4 **The Contractor shall not suspend or delay the work and proceed with the work with due diligence in accordance with Engineer's decision. The Engineer also shall not withhold any payment, which, according to him, is due or payable to the Contractor, on the ground that certain disputes have cropped up and are likely to be referred to arbitration.**

10.5 **Provided always as follows:**

[a] **Nothing of the provisions in paragraphs 10.3 to 10.3.7 hereinabove would apply in the cases of contracts, where tendered amount appearing in the letter of acceptance of the tender / offer is less than Rs.40,00,000/-.**

[b] **The Contractor shall have to raise disputes or differences of any kind whatsoever in relation to the execution of the work to the Engineer within 30 days from the date of occurrence of the cause of dispute and before the preparation of the final bill, giving detailed justifications, in the context of contract conditions.**

[c] Contractor's dispute if any arising only during the maintenance period, if any, stipulated in the contract, must be submitted to the Engineer, with detailed justification in the context of contract conditions, before the issuance of final completion certificate in Form G.C.-2 ibid.

No dispute or difference on any matters whatsoever, the Contractor can raise pertaining to the Contract after submission of certificate in form G.C.3 by him.

[d] Contractor's claim / dispute raised beyond the time limits prescribed in sub-clauses 10.5[b] and 10.5 [c] hereinabove, shall not be entertained by the Engineer and / or by any Arbitrator subsequently.

[e] The Chairman / Trustees shall have the right to alter the panel of Arbitrators, vide Clause 10.3 hereinabove, on their sole discretion, by adding the names of new Arbitrators and / or by deleting the names of existing Arbitrators, without making any reference to the Contractor.

(TO BE SUBMITTED WITH COVER- I OFFER)

THE BOARD OF TRUSTEES FOR SMP, KOLKATA

FORM OF TENDER (UNPRICED)

To
The Chief Engineer
Kolkata Dock System
SMP,KOLKATA.

I/We_____
having examined the site of work, inspected the Drawings and read the specifications, General & Special Conditions of Contract and Conditions of the Tender, hereby tender and undertake to execute and complete all the works required to be performed in accordance with the Specification, Bill of Quantities, General & Special Conditions of Contract and Drawings prepared by or on behalf of the Trustees and at the rates & prices set out in the annexed Bill of Quantities within _____months / weeks from the date of order to commence the work and in the event of our tender being accepted in full or in part. I / We also undertake to enter into a Contract Agreement in the form hereto annexed with such alterations or additions thereto which may be necessary to give effect to the acceptance of the Tender and incorporating such Specification, Bill of Quantities, Drawing and Special & General Conditions of Contract and I / We hereby agree that until such Contract Agreement is executed the said Specification, Bill of Quantities, Conditions of Contract and the Tender, together with the acceptance thereof in writing by or on behalf of the Trustees shall be the Contract.

THE TOTAL AMOUNT OF TENDER Rs. **NOT TO BE QUOTED IN COVER I OFFER**

(Repeat in words) **NOT TO BE QUOTED IN COVER I OFFER**

I / We require_____days / months preliminary time to arrange and procure the materials required by the work from the date of acceptance of tender before I We could commence the work.

I / We have deposited with the Trustees' FA&CAO, vide Receipt No._____of _____as Earnest Money.

I / We agree that the period for which the tender shall remain open for acceptance shall not be less than four months.

_____

Dated: (Signature of Bidder with Seal)

WITNESS:

Name of the Bidder:

Signature:

Name: Address:

(In Block Letters)

Address:

Occupation:

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
KOLKATA DOCK SYSTEM
FORM G.C.1

Contractor _____

Address ----------

Date of completion: -

Dear sir(s),

This is to certify that the following work viz: -

Name of work: - …….

…….

…….

Estimate No. E.E.0……Dt……..

C.E.O……..Dt……..

Work Order No……
Allocation……
Contract No. ……

which was carried out by you is in the opinion of the undersigned complete in every respect on the _____ day of_____2021 in accordance with terms of the Contract and you are required to maintain the work as per Clause 62 of the General Conditions of Contract and under provisions of the Contract for a period of_____weeks / months / years

from the_____day of _____2021 to_____day of_____2021.

Yours faithfully,

Signature…….
(ENGINEER/ENGINEER'S REPRESENTATIVE)
Name…….
Designation……
OFFICE SEAL

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
KOLKATA DOCK SYSTEM

FORM G.C.2.

Certificate of Final Completion.

The Financial Adviser & Chief Accounts Officer/The Manager (Finance), Haldia Dock Complex.

This is to certify that the following work viz: -

Name of work: …….

Estimate No. E.E.O……..dt…….
C.E.O……dt…….

Work Order No……..

Contract No. ……

Resolution & Meeting No. ……

Allocation: ……

which was carried out by Shri/Messrs……. is now complete in every respect in accordance with the terms of the Contract and that all obligations under the Contract have been fulfilled by the Contractor.

Signature…….
(ENGINEER/ENGINEER'S REPRESENTATIVE)
NAME…….
DESIGNATION…….
OFFICE SEAL

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
KOLKATA DOCK SYSTEM

FORM G.C.3

(NO CLAIM CERTIFICATE)

The
CHIEF ENGINEER
KOLKATA DOCK
SYSTEM
SMP,KOLKATA
(Atten:……
……

Dear Sir,

I / We do hereby declare that I / we have executed the following work viz: -

Name of work: - _____

_____

Work Order No: -_____

Contract No. _____

Agreement No……..Dt……

and I / we have no further claim against the SMP,KOLKATA in respect of the said work.

Yours faithfully,

(Signature of tenderer)
Dated _____

Name of Contractor……

Address:…….

(OFFICIAL SEAL OF THE CONTRACTOR)

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

PROFORMA OF FORM OF AGREEMENT

THIS AGREEMENT made_____day of _____20_between the "Board Of Trustees for SYAMA PRASAD MOOKERJEE PORT,KOLKATA , a statutory body constituted under Major Port Trust Act ,1963 under the rules there under and statutory modification thereto having Registered Office at 15, Strand Road , KOLKATA -700001 (hereinafter called "EMPLOYER'' which expression unless excluded by or repugnant to the context be deemed to include his successor/s in office) on the one part and _____ _____(hereinafter called the "CONTRACTOR" which expression shall unless excluded by or repugnant to the context he deemed to include his heirs, executors, administrators, representative, successor in officer and permitted assigns) of the other part.

WHEREAS The TRUSTEES are desirous that certain works should be executed viz_____and have accepted a Tender/Offer by the contractor for the execution, completion and maintenance of such works.

NOW THIS CONTRACT AGREEMENT WITNESSETH as follows: -

1. **In this agreement words expressions shall have the same meanings as are respectively assigned to them in General Conditions Of Contract, hereinafter referred to.**

2. **The following documents shall be deemed to form and be read and construed as part of this Agreement, viz: -**

   i. **The said Tender/Offer & the acceptance of Tender/ Offer.**

   ii. **The Drawings.**

   iii. **The General Conditions Of Contract.**

   iv. **Special Conditions Of Contract (If any).**

   v. **The Conditions Of Tender.**

   vi. **The Specifications.**

   vii. **The Bill Of Quantities.**

   viii. **All correspondences by which the contract is added, amended, varied or modified in any way by mutual consent.**

3. **In consideration of the payments to be made by the Trustees to the Contractor as hereinafter mentioned the contractor hereby covenant with the Trustees to execute, complete and maintain the work in conformity in all respects with the provisions of Contract.**

4. **The Trustees hereby covenants to pay to the contractor in consideration of such execution, completion and maintenance of the works the Contract Prices at the times and in the manner prescribed by the contractor.**

IN WITNESS whereof the parties hereto have caused their respective Common Seals to be hereunto as fixed (or have set their respective hands and seals) the day and year first above written.
have executed these presents on the day and year first above written.

The Seal of _____

Was hereunto affixed in the presence of: -

Name: - _____

Address: -_____

OR

SIGNED SEALED AND DELIVERED

By the said _____

In the presence of: -

Name: - _____

Address: -_____

The Common Seal of the Trustees was hereunto affixed in the presence of: -

Name: - _____

Address: -_____

Proforma Of Irrevocable Bank Guarantee (PERFORMANCE BOND) in lieu of cash Security Deposit, to be issued by the Kolkata/ Haldia Branch, as the case may be, of any nationalised Bank of India on Non-Judicial Stamp Paper worth Rs 50/- or as decided by the Engineer/ Legal Adviser of the Trustees.

Ref. _____ Bank Guarantee No. _____

Date _____

To
The Board of Trustees
SYAMA PRASAD MOOKERJEE PORT,KOLKATA
15, Strand Road
Kolkata – 700 001

Dear Sirs,

In consideration of the Board of Trustees ,SYAMA PRASAD MOOKERJEE PORT, Kolkata, - (hereinafter referred to as the " EMPLOYER" which expression shall unless repugnant to the context or meaning thereof include its successors administrators and assigns) having awarded to _____, with registered office at _____ (hereinafter referred to as the "CONTRACTOR " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a CONTRACT by issue of EMPLOYER'S work order dated_____the same having been unequivocally accepted by the Contractor resulting in a 'CONTRACT' bearing Letter Of Award No _____ dated _____ Valued at Rs _____for " " and the contractor having agreed to prove a Contract performance Guarantee for the faithful performance of the entire Contract equivalent to Rs. (Rupees only) to the EMPLOYER.

We, the Bank, , Kolkata/ Haldia having its Head Office at (hereinafter referred to as the "Bank", which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer on demand any and all monies payable by the Contractor to the extent of Rs. -(only) as aforesaid at any time upto without any demur, reservation, contest, recourse or protest an/or without any reference to the CONTRACTOR, Any such demand made by Employer on the Bank shall be conclusive and binding notwithstanding any difference between EMPLOYEER and CONTRACTOR or any dispute pending before any Court, tribunal, Arbitrator or any other Authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of employer and further agrees that the guarantee herein contained shall continue to be enforceable till the Employer discharges his guarantee.

EMPLOYER shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee from time to time to extend the time for performance of the CONTRACT by CONTRACTOR. Employer shall have the fullest liberty, without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or any right which they might have against Contractor, and to exercise the same at any time in any manner, and other to enforce or to forebear to enforce any covenants, contained or implied, in the CONTRACT between EMPLOYER and CONTRACTOR or any other course of remedy or security available to EMPLOYER . The Bank shall not be released of its obligations under these presents by any exercise by EMPLOYER of its liberty with reference to the matters aforesaid or any of them or by reason or any other acts of omission or commission on the part of employer or any other indulgence shown by EMPLOYER or by any other matter or thing whatsoever which under Law would, but for this provision, have the effect of reliving the bank.
The Bank also agreed that EMPLOYER at its option shall be entitled to enforce this Guarantee against the Bank as principal debtor, in the first instance without proceeding against CONTRACTOR and notwithstanding any security or other guarantee that EMPLOYER may have in relation to the CONTRACTOR'S liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is restricted to Rs (rupees only) and it shall remain in force up to and including and shall be extended from time to time for such period, on whose behalf this guarantee has been given.

Dated, this ……. day of ……..2021 ..... at …….

WITNESSES

--- ---
(Signature) (Signature)

--- ---
(Name) (Name)

--- ---
(Official address) (Designation with Bank Stamp)
+ Attorney as per power of Attorney No.

SECTION- 4

SPECIAL CONDITIONS OF CONTRACT

A. GENERAL:

1. Definitions
2. Interpretation
3. Language and Law
4. Nodal Office or his Nominee
5. Delegation
6. Communications
7. Joint Venture
8. Sub-Contracting
9. Personnel–Contract Representative
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A. General

1. Definitions: GAD – General Arrangement Drawing, ITB - Instructions to Bidders, PMC - Project Management Consultants, SMPK –SYAMA PRASAD MOOKERJEE PORT,KOLKATA; KOPT means KOLKATA PORT TRUST;BOT means "Board of Trustees"; EIC means Engineer –In-Charge ;

GCC means General Conditions of Contract

Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

Events are those defined in the Bidding Document

The **Completion Date** is the date of completion of the Works as certified by the Engineer-in-charge (Nodal Officer) or his nominee in accordance with the Bidding Document

The **Contract** is the contract between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause2 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body whose Bid to carry out the works has been accepted by the Employer.

The **Contractor's Bid** is the completed Bidding documents submitted by the Contractor to the Employer.

The **Contract Price** is the price stated in the letter of acceptance and thereafter as adjusted in accordance with the provisions of the Contract.
Days are calendar days, months are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The **Defects Liability Period** is the period mentioned in the Contract Data and calculated from the date of Completion of the work.

The **Employer** is the party who will employ the Contractor to carry out the Works.

The **Engineer-in-charge** (Nodal Officer) or his nominee is the person named in the Contract Data (or any other competent person appointed and notified to the contractor to act in place of the Engineer- in-charge or his nominee who is responsible for supervising the work, administering the Contract, certifying payments due to the Contractor, issuing and valuing Variations to the Contract, awarding extensions of time and valuing the other Events.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to execute the Works.

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer-in-charge (Nodal Officer) or his nominee by issuing an extension of time.

Material are all supplies, including consumables, used by the contractor for execution of the Works.

Plant is an integral part of the Works which is required for the work and brought at site of work by the contractor.

The **Site** is the area defined in the Contract Data.

Site Investigation Reports are those, which are included in the Bidding documents and are factual interpretative reports about the surface and sub-surface conditions at the site.

Specification means the Specification of the Works included in the Contract and any modification or addition made are to be approved by the Engineer-in-charge (Nodal Officer) or his nominee.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Date.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

Temporary Works are works designed, constructed, installed and removed by the Contractor to facilitate the main work which are needed for construction or installation and subsequently removed by the contractor after completion of the main work.

A **Variation** is an instruction given by the Engineer-in-charge (Nodal Officer) or his nominee which varies the Works.

The **Works** are what the Contract requires from the Contractor to construct, install as defined in the Contract Data.

The **Trained Work** Person are those employed / proposed to be employed by the Contractor at the Project Site, who have participated and are in possession of a valid Competency Certificate through a programme run under the auspices of a University, State Technical Board, Ministry of Government of India.

2. Interpretation

In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer-in-charge (Nodal Officer) or his nominee will provide Instructions clarifying queries about the Conditions of Contract.

The documents forming the Contract shall be interpreted in the following order of priority:

(1) Agreement
(2) Letter of Acceptance and notice to proceed with works Contractor's Bid
(3) Contract Data
(4) Conditions of Contract including Special Conditions of Contract
(5) Specifications
(6) Drawings
(7) Bill of quantities

(8) Any other documents listed in the Contract Data as forming part of the Contract.

3. Language and Law

The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer-in-charge (Nodal Officer) or his nominee's Decisions

Except where otherwise specifically stated, the Engineer-in-charge (Nodal Officer) or his nominee will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

The Engineer-in-charge (Nodal Officer) or his nominee may delegate any of the duties and responsibilities to other nominated people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act 1872).

7. Joint Venture

Refer **ITB**

8. Sub-contracting

The Contractor may sub-contract with the approval of the Engineer-in-charge (Nodal Officer) or his nominee but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractor's obligations.

Other Contractors

The Contractor shall co-operate and share the Site with other contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of other contractors. The Contractor shall as referred to in the Contract Data, also provide facilities and services for the works described in the Schedule. The employer may modify the schedule of other contractors and shall notify the contractor of any such modification.

9. Personnel

The Contractor shall employ the key personnel named in the Schedule of Key Personnel as referred to in the Contract Data to carry out the functions stated in the Schedule or other personnel approved by the Engineer-in-charge (Nodal Officer) or his nominee. The Engineer- in-charge (Nodal Officer) or his nominee will approve any proposed replacement of Key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

If the Engineer-in-charge (Nodal Officer) or his nominee asks the Contractor to remove a person who is a member of the Contractor's staff of his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and he should not have any further connections with the work in the Contract.

10. Employer's and Contractor's Risks

The Employer carries the risks which this Contract states are Employer's risks and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

The Employers risks are,

In so far as they directly affect the execution of the Works in the country where the Permanent Works are to be executed:

(1) War and hostilities (whether war be declared or not), invasion, act of foreign enemies;

(2) Rebellion, revolution, insurrection, or military or usurped power, or civil war;

(3) Ionizing radiations, or contamination by radio activity from any nuclear fuel, or from any nuclear waste, from the combustion of nuclear fuel, radio active toxic explosive or other hazardous properties of any explosive nuclear assembly or nuclear component thereof;

(4) Pressure waves caused by aircraft or other aerial devices travelling at sonic or supersonic speeds; and

(5) Riot, commotion or disorder, unless solely restricted to the employees of the Contractor or of his Sub contractors and arising from the conduct of the Works;

(6) Floods, tornadoes, earthquakes and land slides

(7) Loss or damage due to the use or occupation by the Employer of any Section or part of the Permanent Works, except as may be provided for in the Contract;

(8) Loss or damage to the extent that it is due to the design of the Works, other than any part of the design provided by the Contractor or for which the Contractor is responsible; and

(9) Any operation of the forces of nature (in so far as it occurs on the Site) during progress of work.

(10) could not have reasonably foreseen, or

(11) could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures:

® Prevent loss or damage to physical property from occurring by taking appropriate measures,

or

® Insure against.

12. Contractor's Risks

All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract are the responsibility of the Contractor.

13. Insurance

The Contractor shall provide in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of the Defects Liability Period, in the amounts and

Deductibles stated in the Contract Data for the following events which are due to the Contractors' risks.

a. Loss of or damage to the Works, Plant and Materials
b. Loss of or damage to Equipment;
c. Loss of or damage of property (except for Plant, Materials and Equipment supplied by the contractor for work) in connection with he Contract;

and

d. Personal injury or death.

Policies and certificates for insurance shall be submitted by the Contractor to the Engineer-in-charge (Nodal

Officer) or his nominee for the Engineer-in-charge (Nodal Officer) for his approval before the Start Date. All such insurances shall provide for compensation to be payable required to compensate the loss or damage incurred.

If the Contractor does not provide any of the policies and certificates required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due.

Alterations to the terms of an insurance shall not be made without the approval of the Engineer-in- charge (Nodal Officer) or his nominee.

Both parties shall comply with all conditions of the insurance policies.

14. Site Investigation Reports

The contractor, in preparing the bid, shall visit the site, rely on the site condition &, on the Site information referred to in the Contract Data, supplemented by any information available to the Bidderregarding site.

15. Queries about the Contract Data.

The Engineer-in-charge (Nodal Officer) or his nominee will clarify queries on the Contract Data.

16. Contractor to Construct the Works.

The Contractor shall construct and install the Works in accordance with the detailed technical data , Specifications and Drawings provided in Contract Data based on which Engineering to be made and after approval of the Design & Drawings by the client/PMC, construction of the project to be executed.

17. The Works to Be Completed by the Intended Completion Date.

The Contractor shall commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor as updated with the approval of the Engineer-in-charge (Nodal Officer) or his nominee, and complete them by the Intended Completion Date. The Contractor shall be responsible for detail Engineering and construction.
Approval of Client/PMC shall not alter the Contractor's responsibility for the design of the project.

18. Approval by the Engineer-in-charge (Nodal Officer) or his nominee.

The Contractor shall also submit Specifications and Drawings showing the proposed Temporary Works to facilitate main work to the Engineer-in-charge (Nodal Officer) or his nominee, who will approve them if they comply with the Specifications and Drawings.

The Contractor shall be responsible for design of all aforesaid temporary works.

The Engineer-in-charge (Nodal Officer) or his nominee's approval shall not alter the Contractor's responsibility for design of the Temporary Works.

All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer-in-charge (Nodal Officer) or his nominee before their use.

19. Safety.

The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries.

Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Engineer-in-charge (Nodal Officer) or his nominee of such discoveries and carryout the Engineer-in-charge (Nodal Officer) or his nominee's instructions for dealing with them.

21. Possession of the Site.

The Employer shall give possession of all parts of the Site to the Contractor, free from encumbrances. If possession of apart is not given by the date stated in the Contract Data the Employer is deemed to have delayed the start of the relevant activities and necessary extension of time in this regard will be given.

22. Access to the Site

The Contractor shall allow the Engineer-in-charge (Nodal Officer) or his nominee and any person authorized by the Engineer-in-charge (Nodal Officer) or his nominee access and PMC team to the Site to any place where work in connection with this Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured, fabricated and/or assembled for the subject works.

23. Instructions the Contractor shall carryout all instructions of the Engineer-in-charge (Nodal Officer) or his nominee which comply with the applicable laws where the Site is located.

24. Disputes

Any dispute during contract period will be governed by Clause no.10 of GCC.

25. Settlement of Disputes

In the event of disputes between the contractor and the Board of Trustees in a contract, the same will be dealt as under except where otherwise provided in contract, all questions and disputes relating to the meaning of the specifications, designs, drawings and instructions where in before mentioned and as to the quality of workmanship or materials used on the work or as to any other questions of claim, right, matter or thing whatsoever, in anyway, arising out of, relating to the contract, designs, drawings specifications or otherwise concerning the works or the execution or failure to execute the same, whether arising during the progress of the work or after the completion or abandonment thereof, shall be referred to arbitral tribunal with Sole Arbitrator as follows:

The selection and appointment of the arbitrator shall be made by SMPK from a panel of Arbitrator.
Settlement of Disputes is also governed by Clause no.10 of GCC

B. TIME CONTROL

26. Program

Within the time stated in the Contract Data the Contractor shall submit to the Engineer-in-charge (Nodal Officer) or his nominee for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the works along with monthly cash-flow forecast.

An update of the Program shall be a program showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining work including any changes to the sequence of the activities.

The Contractor shall submit to the Engineer-in-charge (Nodal Officer) or his nominee, for approval an updated Program at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Program within this period, the Engineer-in-charge (Nodal Officer) or his nominee may withhold the amount stated in the Contract Data from the next payment certificate and continue to with hold this amount until the next payment after the date on which the over due Program has been submitted.

The Engineer-in-charge (Nodal Officer) or his nominee's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer-in- charge (Nodal Officer) or his nominee again at any time to expedite the progress of work in the project.. A revised Program is to show the effect of Variations for the benefit and progress of the project..

27. Extension of the Completion

If the Contractor shall desire an extension of time for completion of the work on the grounds of his having been unavoidably hindered during execution or on any other grounds, he shall apply in writing to the Competent Authority within 30 days of the date of hindrance on account of which he desires such extension as aforesaid and the Competent Authority shall if in his opinion, the ground of extension of time prayed for is reasonable , therefore, he may grant extension of time on same contract terms, as the cause in his opinion is correct and extension is require for smooth completion of the project without any extra benefits on that ground.

28. The Early warning provisions shall be as per Clause 31.

29. Delays Ordered by the Engineer-in-charge (Nodal Officer) or his nominee

The Engineer-in-charge (Nodal Officer) or his nominee may instruct the Contractor to delay the start or progress of any activity within the Works at any time.

30. Management Meetings

Either the Engineer-in-charge (Nodal Officer) or his nominee or the Contractor may require the other to attend a management meeting with PMC. The business of a management meeting shall be to review the plans of work, plans for remaining work and to deal with matters raised in accordance with the early warning procedure.

The Engineer-in-charge (Nodal Officer) or his nominee shall record the business of management meetings and is to provide copies of his record to those attending the meeting. The responsibility of the parties for actions to be taken is to be decided by the Engineer-in-charge (Nodal Officer) or his nominee either at the management meeting or after the management meeting and stated and communicated in writing to all who attended the meeting.

31. Early Warning

The Contractor is to warn the Engineer-in-charge (Nodal Officer) or his nominee at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work or delay the execution (progress)of works. The Engineer-in-charge (Nodal Officer) or his nominee may require from the Contractor to provide in detail the reasons for such unexpected events

The Contractor shall cooperate with the Engineer-in-charge (Nodal Officer) or his nominee in making and considering proposals for how the deal such an event or expected circumstance can be avoided and take a judicious decision jointly involving PMC team to carry out the work smoothly to maintain the progress and any resulting instruction of the Engineer- in-charge (Nodal Officer) or his nominee will be communicated to the contractor.

C. QUALITY CONTROL

32. Identify Defects

The Engineer in charge (Nodal Officer) or his nominee or PMC team shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities for timely completion of the work.. The Engineer-in-charge (Nodal Officer) or his nominee or PMC may instruct the Contractor to search for a Defect and to uncover and test any work that they consider may have a Defect.

33. Tests

If the Engineer-in-charge (Nodal Officer) or his nominee or PMC instructs the Contractor to carry out a test to check whether any work the Contractor shall comply that instruction and arrange for that test to satisfy them to ensure quality of work.

34. Correction of Defects

The Engineer-in-charge (Nodal Officer) or his nominee or PMC shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

Every time notice of a Defect is given the Contractor shall correct the notified Defect within the length of time specified by the Engineer-in-charge (Nodal Officer) or his nominee's notice.

35. Uncorrected Defects.

If the Contractor has not corrected a Defect within the time specified in the Engineer-in-charge (Nodal Officer) or his nominee's notice the Engineer-in-charge (Nodal Officer) or his nominee will assess the cost of having the Defect corrected, and the Contractor will pay this amount failing which same will be recovered from their due.

D. COST CONTROL

36. Schedule of payment

The schedule of payment shall contain items for the construction, supply, installation, testing and commissioning of work to be done by the Contractor.
The Contractor will be paid on percentage basis as mentioned in the break up of lump sum rate to be submitted item wise (to be accepted by SMPK Authority during tender finalization stage)as Schedule of payment for each completed item of the work after certified by the PMC and subsequent acceptance of Engineer in charge or his representative.

37. Payment Certificates.

The Contractor shall submit to the Engineer-in-charge (Nodal Officer) or his nominee monthly statements of the estimated value of the work completed less the cumulative amount certified previously.

The PMC shall check the Contractors' monthly statement(measurement of works) within 7 days and forward it to the Engineer in Charge or his nominee on the basis of which contractor will raise the bill and Directly submitted to the Engineer in Charge or his nominee who will certify the amount to be paid to the Contractor considering all factors as per terms and conditions of the tender and forward the same to Finance wing of SMPK for payment.
The final value of work executed and forwarded for payment(amount) in each bill shall be determined by the Engineer-in-charge (Nodal Officer) or his nominee.PMC has no roll on this.
The Engineer-in-charge (Nodal Officer) or his nominee may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in the light of later information gathered by him in later date..

38. Payments

Joint measurements along with authorized representative of SMPK shall be taken continuously by the contractor and need not to be connected with billing stage. System of 4 copies of measurements, one each for Contractor, Employer and Engineer-in-charge (Nodal Officer) or his nominee and PMC. Bills (GST Invoice) shall be prepared and submitted by the Contractor after signing to the Engineer-in-charge (Nodal Officer) or his nominee.

75% of bill amount may be paid within 14 days of submission of the bill. Balance amount of the verified bill may be paid within 28 days of the submission of the bill.

Contractor shall submit final Bill within 60 days of issue of defects liability certificate. Client's Engineer-in-charge (Nodal Officer) or his nominee shall check the bill within 60 days after its receipt and return the bill to Contractor for corrections, if any. 50% of undisputed amount shall be paid to the Contractor at the stage of returning the bill.

The contractor should re-submit the bill, with corrections within 30 days of its return by the Engineer-in-charge (Nodal Officer) or his nominee. There-submitted bill shall be checked and paid within 60 days of its receipt.

As it is a **Lumpsum** contract there is no scope of payment of any extra-excess works unless otherwise instructed and communicated in writing by the Engineer in charge during validity of the contract.
So no payment for any extra-excess work will be entertained in this contract in general Unless otherwise specifically instructed by the Engineer-In-Charge and communicated through written instruction.

39. Tax

The rates quoted by the Contractor shall be deemed to be inclusive of all taxes and duties except GST that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at sources as per applicable law. GST will be given by SMPK as per prevailing rate.

40. Currencies

All payments shall be made in Indian Rupees.

41. Retention

The Employer shall retain SD from each payment, due to the Contractor the proportion stated in theContract Data and GCC until Completion of the whole work.
Retention Money shall be deducted as per relevant clause 3.4 & 3.5 of GCC. Retention SD money shall be refunded after completion of maintenance period as per clause 9.3 of GCC
Performance Guarantee of 10% will be retained upto completion of Defect Liability Period and thereafter refunded.

42. Liquidated Damages

In case of delay in completion of the contract, liquidated damages (L.D) will be levied at the rate of half percent (1/2 %) of the contract value per week of delay or part there of subject to a maximum of 10 percent of the contract price and it will be governed by clause 8.2(a) &(b) of GCC.

- The owner, if satisfied, that the works can be completed by the contractor within a reasonable time after the specified time for completion, may allow further extension of time at its discretion with or without the levy of L.D. In the event of extension granted being with L.D., the owner will be entitled without prejudice to any other right or remedy available in that behalf, to recover from the contractor's bill as agreed damages equivalent to half percent (1/2 %) of the contract value of the works for each week or part of the week subject to the ceiling.
- The owner, if not satisfied that the works can be completed by the contractor and in the event of failure on the part of the contract or to complete work within further extension of time allowed as aforesaid, shall be entitled, without prejudice to any other right, or remedy availablein that behalf, to rescind the contract.
- The owner, if not satisfied with the progress of the contract and in the event of failure of the contractor to recoup the delays in the mutually agreed time frame, shall be entitled to terminate the contract.
- In the event of such termination of the contract as described in clauses 8.3 of GCC or

  both , the owner shall be entitled to recover L.D. upto ten percent (10%) of the contract value and forfeit the security deposit made by the contractor besides getting the work completed by other means at the risk and cost of the contractor.
- The ceiling of LD shall be ten percent (10 %) of the project cost in turnkey contracts.

43. Advance payment

There is no provision of Advance Payment in the subject contract.

44. Performance Securities: For detail of Security Deposit(SD)Refer Clause No. -3.4.(f),(g)(h)(i)& 3.5 & 3.6 of GCC

45. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction period shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. FINISHING THE CONTRACT.

46. Completion

After completion of the work, the contractor will intimate through a written notice to the Engineer-in-charge (Nodal Officer) or his nominee/Employer to this effect. The Engineer-in-charge (Nodal Officer) or his nominee/Employer &PMC upon receipt of this notice shall conduct a complete joint survey of the work within 7 days and prepare a defects list jointly. The defects pointed out by the Engineer-in-charge (Nodal Officer) or his nominee/Employer would be rectified by the contractor within 14 days and there after acceptance report be signed jointly by the contractor and the Employer. This joint acceptance report shall be treated as 'Completion Certificate'.

47. Taking Over

The Employer shall take over the Site and the Works within seven days of the Engineer-in-charge (Nodal Officer) or his nominee issuing a certificate of Completion.

48. Final Account

The Contractor shall supply to the Engineer in charge (Nodal Officer) or his nominee a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer-in-charge (Nodal Officer) or his nominee shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 60 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer-in-charge (Nodal Officer) or his nominee shall issue within 15 days a schedule that states the scope of the corrections or additions that are necessary for the correction and certify payment of 50% of the undisputed amount to the contractor. If the Final Account is still unsatisfactory after it has been re-submitted by the contractor the Engineer-in-charge (Nodal Officer) or his nominee shall decide on the amount payable to the Contractor and issue a payment certificate, within 60 days of receiving the Contractor's revised account.

49. Operating and Maintenance Manuals

"As built" Drawings in both hard and soft format are required to be submitted by the and shall supply them by the dates stated in the Contract Data before handing over of site by the contractor to the client.

If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer-in-charge (Nodal Officer) or his nominee's approval, the Engineer-in-charge (Nodal Officer) or his nominee shall withhold the amount stated in the Contract Data from payments due to the Contractor.

50. Termination

The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

Fundamental breaches of Contract include, but shall not be limited to the following:

(a) The Contractor stops work for 28days when no stoppage of work is shown on the current Program and the stoppage has not been authorised by the Engineer-in-charge (Nodal Officer) or his nominee: The Engineer-in-charge (Nodal Officer) or his nominee instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days.

(b) The Employer or the Contractor becomes bankrupt or goes into liquidation .

(c) A payment certified by the Engineer-in-charge (Nodal Officer) or his nominee is not paid by the Employer to the Contractor within 60 days from the date of the Engineer-in-charge (Nodal Officer) or his nominee's certification.

(d) The Engineer-in-charge (Nodal Officer) or his nominee gives notice to correct a particular ,which is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer-in-charge (Nodal Officer) or his nominee.

(e) The Contractor does not maintain a security and safe working procedure, which is required for safety the work at site.

(f) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

(g) If the contractor has contravened clauses mentioned in Bidding Document.

(h) Clauses 8.3 of GCC will be also applicable

When either party to the Contract gives notice of a breach of contract to the Engineer-in-charge (Nodal Officer) or his nominee for a cause other than those listed above, the Engineer-in-charge (Nodal Officer) or his nominee shall decide whether the breach is fundamental or not.

Not withstanding the above, the Employer may terminate the Contract for convenience subject to payment of compensation to the contractor including loss of profit on uncompleted works. Loss of profit shall be calculated on the same basis as adopted for calculation of extra/additional items.

If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

51. Payment upon Termination.

If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer-in-charge (Nodal Officer) or his nominee shall issue a certificate for the value of the work done less payments received upto the date of the issue of the certificate, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer-in-charge (Nodal Officer) or his nominee shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and loss of profit on uncompleted works less payments received upto the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

52. Property

All materials on the Site, Plant, Equipment, Temporary Works and Works for which payment has been made to the contractor by the Employer, are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

53. Release from Performance.

If the Contract is frustrated by the outbreak of war or by other event entirely outside the control of either the Employer or the Contractor, the Engineer-in-charge (Nodal Officer) or his nominee shall certify that the Contract has been frustrated. The Contractor shall leave the Site and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made.

F. <u>EXTRA CONDITIONS OF CONTRACT</u>

54. LABOUR

The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport & other incidental costs.

The Contractor shall, if required by the Engineer-in-charge (Nodal Officer) or his nominee, submit to the Engineer-in-charge (Nodal Officer) or his nominee a list in detail, in such form and at such intervals as the Engineer-in-charge (Nodal Officer) or his nominee may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer-in-charge (Nodal Officer) or his nominee may require.

55. COMPLIANCE WITH LABOUR REGULATIONS:

During continuance of the contract, the Contractor and his sub-contractors shall abide by at all times all existing labour enactment and rules made there under, regulations, notifications and by laws of the State or Central Government or local authority and any other labour law (including rules) regulations, by laws that may be passed or notification that may be issued under any labour law in future either by the State or Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the Appropriate Authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/by

laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor the Engineer-in-charge (Nodal Officer) or his nominee/Employer shall have the right to deduct any money due to the Contractor including his amount of performance security. The Employer/Engineer-in-charge (Nodal Officer) or his nominee shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

SALIENT FEATURES OF SOME MAJOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.

(a) Workmen Compensation Act 1923: - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(b) Payment of Gratuity Act 1972: Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years service or more on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(c) Employees P.F and Miscellaneous Provision Act 1952: The Act Provides for monthly contributions by the employer to workers at nominated rate.The benefits payable under the Act are: (i) Pension to family pension on retirement or death, as the case may be. (ii) Deposit linked insurance on the death in harness of the worker, (iii) payment of P.F accumulation on retirement/death etc.

(d) Maternity Benefit Act 1951: - The Act provides for leave and some other benefits to workmen/employees in case of confinement or miscarriage etc.

(e) Contract Labour (Regulation & Abolition) Act 1970: - The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labours.

(f) Minimum Wages Act 1948: The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment Construction of Buildings, Roads, Runways are scheduled employment.

(g) Payment of Wages Act 1936: - It lays down as to by what date the wages are to be paid when it will be paid and what deductions can be made from the wages of the workers.

(h) Equal Remuneration Act 1979: - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

(i) Payment of Bonus Act 1965: The Act is applicable to all establishments employing 20 or more employees. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing Rs.3500/- per month or less. The bonus to be paid to employees getting Rs. 2500/- per month or above upto Rs. 3500/- per month shall be worked out by taking wages as Rs. 2500/- per month only. The Act does not apply to certain establishments. Then newly set-up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of this Act.

(j) Industrial Disputes Act 1947: - The Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations a strike or lock out becomes illegal and what are the requirements for laying off or re-trenching the employees or closing down the establishment.

(k) Industrial Employment's (Standing Orders) Act 1946: - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). Provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get same certified by the designated Authority.

(l) Trade Unions Act 1926: - The Act lays down the procedure for registration of trade union of workmen and employers. The Trade Union registered under the Act have been given certain immunities from civil and criminal liabilities.

(m) Child Labour (Prohibition & Regulation) Act 1986: - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of Children in all other occupations and processes. Employment of Child Labor is prohibited in Building and Construction Industry.

(n) Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979: -

The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, travelling expenses from home upon the establishment and back, etc.

(o) The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996: - All the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the Building or Construction work and other welfare measures, such as Canteens, First-Aid facilities. Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

(p) Factories Act 1948: - The Act lays down the procedure for approval at plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 more persons without the aid of power engaged in manufacturing process.

G. SPECIAL INSTRUCTIONS TO BIDDERS

(a)CLAIMS AND DISPUTES:

Any claims or disputes arising out of the contact should be promptly submitted in writing to the Engineer-in-Charge within one month from the date of cause of action so that the points at issue could be immediately verified at site by the field officers, facts ascertained and a prompt decision can be given. Claims raised beyond this time limit will not be entertained. The tenderers shall carefully note this stipulation.

(b)THE SITE OF WORK:

The work site is located at Inside N.S.Dock of SMP, Kolkata. Tenderer must visit the work site and its surrounding before submission of e- tender, so that due consideration is given to the local conditions at site. The intending tenderer should contact Superintending Engineer, (NSD) 51, C.G.R. Road, Kolkata 700043(Ph: 9836298690) to make the site inspection along with his representative.

©CLAUSE REGARDING SECURITY DEPOSIT

The S.D. will be recovered from the monthly bills at the rate mentioned in GCC until the balance is recovered. The amount of security deposit will be refunded to the Contractor after deducting dues if any to the Port, on expiry of the maintenance period of 10 (Five) years for whole work.

(d)SUB-LETTING:

Engaging of labour on a piece work basis shall not be deemed to be sub-letting.

(e)INSURANCE OF WORKS ETC:

The contractor shall insure in the joint names of the Board and the contractor against all risks of what ever nature viz., all losses or damages from what ever cause arising (other than the except risks) for which he is responsible under the terms of the contract and in such manner that the Board and contractor are covered during the period of execution of the works for any loss or damage, occasioned by the contractor in the course of any operation carried out by him for the purpose of complying with his obligations. The said insurance shall cover the following:

a) The works and the temporary works to the full value of such works executed from time to time.

b) The materials, constructional plant and other things brought on to the site by the contractor to the full value of such materials, constructional plant and other things, such insurances shall be effected with an insurer and in terms approved by the Board (which approval shall not be unreasonably with held) and the contractor shall whenever required produce to the Engineer-in-charge or his representative the policy or policies of insurance and the receipt for payment of current premiums provided always that without limiting his obligations and responsibilities as a foresaid nothing in this clause contained shall render the contractor liable to insure against the necessity for the repair or reconstruction of any work constructed with materials or workmanship not in accordance with the requirements of the contract.
If the insurance policies do not take care of any of the risks identified or part of the work involved, the contractor shall indemnify the Board suitably against such risks and works.

(e) DAMAGE TO PERSONS AND PROPERTY:

The contractor shall (except if and so far as the specification provides otherwise) indemnify and keep indemnified the Board against all losses and claims for injuries or damages to any person in the employment of the Board or any property of the Board whatever (other than surface other damage to land or crops being in the site suffered by tenants or occupiers) which may arise out of or in consequence of the construction and maintenance of work and against all claims, demands,

proceedings, damages, costs, charges and expenses what so ever in respect of or in relation there to. Provided always that nothing here in contained shall be deemed to render the contractor liable for or in respect of or to indemnify the Board against compensation or damages for or with respect to:

- The permanent use or occupation of land by the works or any part there of or (save as here in after provided) surface or other damage as a foresaid.
- The right of the Board to construct the works or any part thereof on/over/under/in or through any land.
- Interference whether temporary or permanent with any right of a airway or water or other easement or quasieasement which is an un-avoidable result of the construction of works in accordance with the contract.
- Injuries or damage to persons or property resulting from any act of neglect done or committed during the execution of the contract of the client or his agents, staff or other contractors (employed by the contractor) or for in respect of any claims, demands, proceedings, damages, costs, charges and expenses in respect there of in relating there to.

- Provided further that for the purpose of this clause the expression "the site shall be deemed to be limited to the area defined in the specification or shown on the drawings or damaged as an inevitable consequence of the carrying out of the works.

(f) Third party insurance:

i) Before commencing the execution of the work, the contractor (but without limiting his obligations and responsibilities) shall insure against any damage, loss or injury which may occur to any property (including that of the Board) or to any person (including any employee of the Board) by or arising out of the execution of the works or temporary works in the carrying out ofthe contract.

ii) Such insurance shall be effected with an Insurer and in terms approved by the Engineer in Charge save and except any accident injury resulting from any act or default of the board his agents or staff and for at least the amount stated in the Tender and Contractor shall, when ever required, produce to the Engineer-in-charge or his representative the policy or policies of insurance and the receipts for payment of the current premiums. The minimum amount of third-party insurance shall be Rs 50 lacs for each occurrence.

(g) 1) The Board shall not be liable for in respect of any damages or compensation payable at Law in respect or in consequence of any accident or injury to any workmen or other persons in the employment of the Contractor. The Contractor shall indemnify and keep indemnified the Board against all such damages and compensation (save and except as aforesaid and expenses whatsoever in respires of in relation there to.

2) The Contractor shall insure against such liability with an insurer approved by the Engineer-in-Charge (which approval shall not unreasonably withhold) and shall continue such insurance during the total tenure of the work and for any persons who are employed by him on the works and shall when required produce to the Engineer-in-Charge or his representative such policy of insurance and the receipt for payment of the current premium.

(h) If the Contractor shall fail to effect and keep in force the insurance referred to above as mentioned here of any other insurances which he may be required to effect under the terms of the contract then and in any such case the Board may effect and keep in force any such insurance pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the Board as aforesaid from any amount due or which may become due to the Contractor or recover the same as a debt due from the Contractor.

(i) The Contractor shall not take away any of the plant and machinery until completion of the work without the written permission of the Engineer-in-Charge.

(j) Not with standing with anything contained in the contract.

i. The Contractor shall be under no liability whatsoever whether by way of indemnity or other wise for or in respect of destruction of or damage to the works or temporary works or to property whether of the Board or third parties or for in respect of injury of loss of life which is the consequence whether direct or indirect effect of war , hostilities (whether war be declared or not) invasion act of foreign enemies, rebellion, revolution, insurrection of military or usurped power civil war (otherwise than among the Contractor's own employees or riot, commotion or disorder (herein after comprehensively referred to as "the said special risks").

ii. If the works or temporary works or any materials (whether for the former or the later) on or near shall sustain destruction or damage by reason of any of the said special risks, the Contractor shall

neverthless been titled to payment for any permanent work already certified.

iii. Destruction, damage, injury or loss of life caused by the explosion or impact wherever and whenever occurring of any mine, bomb, shell, grenade or other projectile, missile, ammunition or explosive of war shall be deemed to be consequence of the said special risks.

iv. The Board shall repay to the Contractor any increased cost incidental to the execution for the works (other than such as may be attributable to the of reconstructing work condemned by the Engineer-in-Charge due to faulty specification and improper workmanship prior to the occurrence of any special risk which is however attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks) (subject however to the provision in the clause here in after contained in regard to outbreak of war). But the Contractor shall as soon as any such increase of cost shall come to his knowledge forthwith notify the Engineer-in-Charge there of in writing.

v. If during the execution of the contract there shall be an outbreak of war (whether war is declared or not) in any part of the work which whether financially or otherwise materially affects the execution of the works the Contractor shall unless and until the contract is terminated, under the provisions contained in this Clause use his best endeavors to complete the execution of the works provided always that the Board shall be entitled at anytime after such out break of war to terminate this contract by giving notice in writing to the Contractor and such notion being given this contract shall (save as to the right of the parties under this clause and to the operation of arbitration clause) terminate but without prejudice to the rights of either parties respires of any incident break thereof.

vi) If the Contract shall be terminated under the provisions of the last proceeding sub-clause, The Contractor shall with all reasonable dispatch remove from the site all constructional plants.

vii) Removal of plant on termination

viii) If the contract shall be terminated as a foresaid the Contractor shall be paid by the Board (in so far as such amounts or items shall not have already been covered by payments on account made to the Contractor) for all work prior to the date of termination at the rates and prices provided in the contractand in addition:

The amounts payable in respect of any preliminary items so far as the work or serve comprised there in has been carried out or performed and proper portion as certified by the Engineer-in-Charge of any such items of the work or service comprised in which has been partially carried out or performed.

The cost of materials of good reasonably ordered for the works or temporary works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery (such materials or goods becoming the property of the Board upon such payment being made by him).

A sum to be certified by the Engineer-in-Charge being the amounts of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole works in so far as such expenditure shall not have been covered by the payments in this sub clause before mentioned.

The reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the works at the time of such termination. Provided always that against any payments due from the Board under above mentioned clause, the Board shall be entitled to be credited with any outstanding balance due from the Contractor for any such previously paid by the Board to the Contractor in respect of the execution of the works.

(k) The tenderers shall return all the drawings issued along with the tender schedules to the Engineer in charge.

56. **Dock Permit**:

For works inside the Docks, Dock permit required for men , materials, vehicles and equipments etc. are to be procured by the successful tenderer **at free of cost** as per recommendation of the executing departments/divisions indicating the specific number of free permits to be issued. But for creation of individual IDs in permit system a charge as applicable, will be levied per person (one time) even for companies/ Individuals who have been granted permission to obtain free permits by KoPT. In case the work has to be carried out in an operational zone, the tenderer should keep in mind that the work is to be executed without hampering the operational activities and should complete the work within the stipulated time specified in the tender.

57. An establishment by the contractor shall have to be maintained within Port area limit for Total Defect Liability Period for taking up issues related to maintenance of the work .

SECTION-5

SCHEDULE OF PAYMENT

SCHEDULE OF PAYMENT

RELEASE OF PAYMENTS:

The lump-sum bid amount for the work as described in as per contract data shall be paid as per details included in Schedule for Interim Payments for each component of the work described therein individually on pro-rata basis for each individual component.

Schedule for Interim Payments
(Schedule given as under will be followed for the work-billing schedule for interim payment)

Sl. No.	Description	Percentage on Contact Value	
		Individual	Total
1.	**Basic Engineering, Surveying, Preparation of working drawings and detailed designs**		**3%**
2.	**Dismantling of Existing Structure**		**1%**
3.	**Completion of Piling and Sheet Piling Works**		**50%**
	a. Supply, fabrication and erection of liner	20%	
	b. Driving of Piles	5%	
	c. Providing Reinforcement in Piles	13%	
	d. Placing Concrete in Piles	10%	
	e. Supply and driving of Z-section Sheet Pile	2%	
4.	**Completion of RCC/PCC works**		**21%**
	i) Providing Beams	7%	
	ii) Providing Slabs	7%	
	iii) Providing Pile Muffs	7%	
5.	**Completion of Installation of Fender**		**1%**
6.	**Completion of Installation of Bollards**		**1%**
7.	**Completion of Construction of Stack Yard**		**10%**
	i) Dismantling and Excavation upto founding level	1%	
	ii) Provision of Granular Layer	0.5%	
	iii) Sand Filling	1%	
	iv) Mattress laying	2%	
	v) Back Filling	2.5%	
	vi) PCC	1%	
	vii) Paver Block Topping	2%	
8.	**Other Miscellaneous Working like fixing of Crane Rail & various tests etc.**		**2%**
9.	**Site Clearance**		**1%**
10.	**Handing over the Work**		**10%**
	TOTAL		**100 %**

Note:

- This break-up is a tentative amount of major activities to be carried out during the execution of the project, however for the payment purpose same should be accepted for the successful bidder by the Engineer-In-Charge of the contract.

a. Part work done on any of the above items shall be paid for on pro-rata basis at the time of submitting each interim bill for the bill submitted by the contractor and verified by PMC & Representative of Engineer-in-Charge.
b. Release of payments are subject to completion of the certification by SMPK.

c. Completion of item means its execution in all respects and certified by the PMC/Engineer-In-Charge e.g.: - Structural Steel Members Fabrication and Erection, RCC Deck Slab, etc., as per Technicalspecifications / Standards.

SCHEDULE OF ITEM FOR EXTRA WORK/DEVIATIONS

In general as it is a Lump-sum contract ,there will be no excess-extra items.

i. The payment for extra items (Not covered in scope of work) will be made if specially instructed by the Engineer-In-Charge and communicated through written communication as per clause No. 7 of the GCC.

ii. The contractor shall submit the BOQ and rates for any item of extra work / deviation, duly furnishing the supporting details for examination by Engineer-in-charge. The EIC may ask the contractor to furnish the existing supporting details in case of rates on the higher side.

SECTION-6

FORMS OF SECURITIES AND OTHER FORMATS

FORMS OF SECURITIES AND OTHER FORMATS

(I) Schedule-T

(II) Schedule- O

(III) Proforma of Performance Certificate/Credential of works

(IV) Documents to be uploaded (Annexure D)

(V) Annexure D-1

(VI) Form of BID Security Declaration (Annexure D-2)

(VII) Proforma of Bank Guarantee (Performance Bond)

(VIII) Format in case of Joint Venture/ Consortium Agreement

(IX) Format for Power of Attorney for Lead Member of Consortium

(X) Format of Joint Bidding Agreement.

(XI) Integrity Pact

(XII) Guidelines for Indian Agents of Foreign Suppliers (Annexure A)

(XIII) Stage Payment (to be executed on Rs.100/- Non-Judicial Stamp Paper)

(XIV) Specimen Letter of Authority from Bank for all BGs (to be executed on Bank's letter head)

(XV) Specimen Letter of Authority for Submission of Bid (to be executed on Rs.100/- Non-Judicial Stamp Paper)

(XVI) Exceptions and Deviations

(XVII) Form of Tender

(XVIII) Pre-Bid Query Format

(XIX) Check List

FORMS OF SECURITIES AND OTHER FORMATS

Acceptable forms of securities are annexed. Bidders should not complete the Performance Security Form at this time. Only the successful Bidder will be required to provide Performance Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

CONTRACTOR **CHIEF ENGINEER,KDS**

SCHEDULE T

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

CONCURRENT COMMITMENT(S) OF THE BIDDER (i.e. Works in The Hand of The Bidder at The Time of Submission of Tender Offer)

(To be submitted with Part-I of Offer)

Bidders must fill in the under noted columns.

Sl. No.	Full particulars of works to be executed concurrently by the bidder. (i) Name of work. (ii) Client. (iii) W.O. No. & Date.	Sanctioned Tender Value. (in Rs.)	Completion time as stated in tender.	Name and address to whom reference can be made.
1	(i)			
	(ii)			
	(iii)			
2	(i)			
	(ii)			
	(iii)			
3	(i)			
	(ii)			
	(iii)			
4	(i)			
	(ii)			
	(iii)			

(To be submitted with Part-I of Offer)

SCHEDULE 'O' SHEET – 1

The Bidders are also requested to furnish the following particulars: -

A) In case of Limited Company -

1) Name of Company :

2) Address of its present registered office. :

3) Date of its incorporation :

4) Full name and address of each of its Directors – any special particulars as to Directors if desire to be stated. :

5) Name, address and other necessary particulars of Managing Agents, if any appointed by the Company. :

6) Copies of Memorandum, Articles of Association (with the latest amendments, if any). :

7) Copies of audited balance sheets of the Company for the last **three years**. :

B) In case of a firm -

1) Name and address of the firm. :

2) When business started :

3) If registered a certified copy of certificate of registration. :

4) A certified copy of the Deed of Partnership :

5) Full name and address of each of the partners and the interest of each partner in the partnership – any special particulars as to partners if desired to be stated. :

6) Whether the firm pays income tax over Rs.10, 000/- per year :

(To be submitted with Part-I of Offer)

SCHEDULE 'O' SHEET – 2.

C) In case of an Individual:

1) Full name and address of the Bidder any special particulars of the Bidder if desired to be stated. :

2) Name of the father of the Bidder. :

3) Whether the Bidder carries on business in his own name or any other name. :

4) When business was started and by whom. :

5) Whether any other person is interested in the business directly or indirectly, if so, name and address etc. of such persons and the nature of such interest. :

6) Whether the Bidder pays Income Tax over Rs.10, 000/- per year. :

Dated: _____ (Full signature of Bidder)

(Proforma of Performance certificate/credential of works)

[To be issued on issuing authority's letterhead duly signed with office seal]

1.	Name of the Certifying Authority:	
2.	Name of the work:	
3.	Name of the Contractor:	
4.	Schedule date of commencement and completion of the work as per Work Order:	
5.	Date of actual commencement of work & date of actual completion:	
6.	i) If there is time overrun, whether delay is due to the contractor (Yes/No.): ii) If yes, what is the extent of delay attributable to the contractor:	
7.	Sanctioned Tender value & Actual value executed:	
8.	Quality of work (Excellent/satisfactory/poor):	
9.	Remarks (If any):	

ANNEXURE – D

DOCUMENTS TO BE UPLOADED ALONG WITH PART –I

Scanned copy of the following documents to be uploaded: -

i) GST registration certificate.

ii) Valid Trade Licence (Valid for current period & also for type of work).

iii) Valid Professional Tax Clearance Certificate / Up to date tax payment challan. If this is not applicable, the bidder must submit a declaration in this regard.

iv) Proof of possessing valid Employees' Provident Fund (EPF) Account. EPF Registration Certificate.

v) Proof of being registered with Employees' State Insurance Corporation (ESIC), ESI Registration Certificate

vi) Details of the firm as per Schedule-O (in Part-I) of the tender document duly filled up.

vii) Credentials in the form of copies of Letters of Award of Works along with corresponding Completion Certificates from owners to justify that the intending bidder satisfies the earlier mentioned pre-qualification criteria.

viii) Balance sheet and Profit and Loss account / Trading account for the last 3 (three) financial years **(i.e. 2018-2019 , 2019-2020 and 2020-21). The same should be audited as per relevant norms wherever required along with UDIN of the Auditor.**

ix) Bank Draft/ Pay Order etc. regarding EMD & Cost of Tender documents / valid NSIC certificate/ MSME certificate.

x) PAN Card.

xi) A list of technically qualified and skilled persons would be engaged to supervise and execute the work (to be mentioned in the letter head of the Firm).

xii) Self-declaration of the bidder that the Bidding Firm has Not been debarred / de- listed by any Govt / Quasi Govt. / Public Sector undertaking in India (to be mentioned in the letter head of the Firm).

xiii) Self-declaration regarding the proprietor/partner(s)/authorized signatory of the bidding firm (in the case of proprietorship firm /partnership firm /limited company, as the case may be) is/are not associated with any other firm bidding for the same work (to be mentioned in the letter head of the Firm).

xiv) A list of works which are in hand at the time of submitting the offer as per the enclosed proforma titled 'Concurrent Commitments of The Bidder' vide 'Annexure-C' (Schedule –T) in Part-I of the tender document.

xv) Undertaking of the tenderer to be submitted as per enclosed Pro-forma (Annexure –D-1) in lieu of submission of signed copies of the full Tender document, G.C.C, addenda & corrigendum in the letter head of the Firm.

xvi) Last page of "Bill of Quantities" & the "Form of Tender" duly filled up (without price quoted) shall be duly signed and stamped by the Bidder.

xvii) Bid security declaration in the prescribed format as per Annexure- D2

Xviii) Integrity Pact

N. B.-1 **The bidder will have to produce the original documents or any additional documents, if asked for, to satisfy the Authorities.**

N.B.-2 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements and their **EMD/SD will be forfeited for such action**.

ANNEXURE –D-1

NIT NO.: SMPK/KDS/CIV/T/2622/60 DT. 29.10.2021

Ref. No…… Dated:

The Chief Engineer,
Syama Prasad Mookerjee Port, Kolkata,
Civil Engineering Department,
15, Strand Road,
Kolkata – 700 001

Dear Sir,

We, ---------- (Name of Tenderer) have fully read and understood the entire Tender Document, GCC, Corrigendum and Addenda, if any, downloaded from under the instant e-tender and no other source, and will comply to the said document, GCC, Corrigendum and Addenda.

We are submitting this undertaking in lieu of submission of signed copy of the full tender documents GCC, Corrigendum and Addenda.

Yours faithfully,

Signature of Tenderer……

Name

Designation:

Date:

Seal of the tenderer…….

Form of Bid Security Declaration

ANNEXURE –D-2

NIT NO.: SMPK/KDS/CIV/T/2622/60 DT. 29.10..2021

Ref. No… Dated:

The Chief Engineer,

Syama Prasad Mookerjee Port, Kolkata,

Civil Engineering Department,

15, Strand Road,

Kolkata – 700 001

We, ---------- (Name of the bidder) understand that, according to your conditions, bids must be supported by a Bid-Security Declaration.

We accept that we will automatically be suspended **for three years** from being eligible for bidding in any contract with the entity that invited Bids for the period of **180 days** starting from the **date of opening tender** if we are in breach of our obligation(s) under the bid conditions, i.e. if we withdraw or modify our Bids during the period of validity.

Yours faithfully,

Signature of Tenderer:

Name:

Designation:

Date:

NIT NO.: SMPK/KDS/CIV/T/2622/60 DT. 29.10.2021

PROFORMA OF BANK GUARANTEE

(PERFORMANCE BOND)

(In lieu of Cash Security Deposit) To be issued by the Kolkata Branch, as the case may be of any Nationalized Bank/Scheduled bank of India on Non-judicial Stamp Paper worth Rs 100/- or as decided by the Authority.

To

Syama Prasad Mookerjee Port, Kolkata,

15, Strand Road,

Kolkata – 700 001

BANK GUARANTEE NO.....DATE.....

Name of Issuing Bank.....

Name of Branch.....

Address.....

In consideration of the Syama Prasad Mookerjee Port, Kolkata **(SMPK)** a Special Purpose Vehicle (SPV) with share of Syama Prasad Mookerjee Port, Kolkata **(SMPK)** and Govt. Of West Bengal having agreed to exempt.....a Proprietary / Partnership /Limited / Registered Company, having its Registered office at .....(hereinafter referred to as the "Contractor") from cash payment of Security Deposit / Payment of Security Deposit through deduction from the Contractors' bills under the terms and conditions of a contract made between the Trustees and the Contractor for.....(write the name of the work as per LOA) in terms of the Letter of Intent No dated.....(herein after referred to as the 'Contract'), for the due fulfilment by the contractor of all the terms and conditions contained in the said contract, on submission of a Bank Guarantee for (Rs.....), we.....Bank.....Branch…….....do, on the advice of the contractor hereby undertake to indemnify and keep indemnified the Trustees to the extent of the said sum of Rs.....(Rupees.....). We,.....

……. Bank ..... Branch, further agree that if a written demand is made by the SMPK through any of its officials for honouring the Bank Guarantee constituted by these presents, We,..... Bank..... Branch, shall have no right to decline to cash the same for any reason whatsoever and shall cash the same and pay the sum so demanded to the Trustees within a week from the date of such demand by an A/c Payee Banker's Cheque drawn in favour of "Syama Prasad Mookerjee Port, Kolkata" without any demur. Even if there be any dispute between the contractor and the Syama Prasad Mookerjee Port, Kolkata, this would be no ground for us..... (Name of Bank). ..... Branch, to decline to honour the Bank

Guarantee in the manner aforesaid. The very fact that We..... Bank ..... Branch, decline or fail or neglect to honour the Bank Guarantee in the manner aforesaid shall constitute sufficient reason for the SMPK to enforce the Bank Guarantee unconditionally without any reference, whatsoever, to the contractor.

2. We…… Bank. .....Branch, further agree that a mere demand by the Trustees at any time and in the manner aforesaid is sufficient for us.....Bank.....Branch, to pay the amount covered by this Bank Guarantee in full and in the manner aforesaid and within the time aforesaid without reference to the contractor and no protest by the contractor, made either directly or indirectly or through Court, can be valid ground for us.....Bank.....Branch, to decline or fail or neglect to make payment to the SMPK in the manner and within the time aforesaid.

3. We .....Bank.....Branch, further agree that the Bank Guarantee herein contained shall remain in full force and effect, during the period that is taken for the due performance of the said contract by the contractor and that it shall continue to be enforceable till all the dues of the SMPK under and/or by virtue of the terms and conditions of the said contract have been fully paid and its claim satisfied and/ or discharged in full and/or till the SMPK certify that the terms and conditions of the said contract have been fully and properly observed/fulfilled by the contractor and accordingly, the Trustees have discharged the Bank Guarantee, subject however, that this guarantee shall remain valid upto and inclusive of days of.....20 and subject also to the provision that the SMPK shall have no right to demand payment against this guarantee after the expiry of 6 (six) calendar months from the expiry of the aforesaid validity period up to.....or any extension thereof made by us.....Bank.....Branch, in further extending the said validity period of this Bank Guarantee on Non-Judicial Stamp paper of appropriate value, as required/determined by the Trustees, only on a written request by the SMPK to the contractor for such extension of validity of this Bank Guarantee.

4. We.....Bank. .....Branch, further agree that, without our consent and without affecting in any manner our obligations hereunder, the SMPK shall have the fullest liberty to vary from time to time any of the terms and conditions of the said contract to extend the time for full performance of the said contract including fulfilling all obligations under the said contract or to extend the time for full performance of the said contract including fulfilling all obligations under the said contract by the contractor or to postpone for any time or from time to time any of the powers exercisable by the SMPK against the contractor and to forebear or enforce any of terms and conditions relating to the said contract and we..... Bank..... Branch shall not be relieved from our liability by reason of any such variation or extension being granted to the contractor or for any fore-bearance, act or commission on the part of the SMPK or any indulgence by the SMPK to the contractor or by any such matter of thing of whatsoever nature, which under the law relating to sureties would, but for this provision have effect of so relieving us .....BanK… ..... Branch.

5. We, ... Bank. ..... Branch, lastly undertake not to revoke this Bank Guarantee during its currency except with the previous consent of the Trustees in writing.

SIGNATURE.....

NAME.....

DESIGNATION.....

(Duly constituted attorney for and on behalf of)
BANK.....

BRANCH ..... (OFFICIAL SEAL OF THE BANK)

NIT NO.: SMPK/KDS/CIV/T/2622/60 DT. 29.10.2021

FORMAT IN CASE OF JOINT VENTURE/CONSORTIUM AGREEMENT

(To be submitted on stamp paper)

This Joint venture/consortium agreement is made at_____on_____day of_____20… between M/s._____(please indicate the status viz. Proprietor, firm, Company) represented through its proprietor /partner or Director (hereinafter referred to as "First Party") and M/s._____(Please indicate the status viz. Proprietor, Firm, Company) represented through its proprietor /partner or Director (hereinafter referred to as "Second Party") WHEREAS the First party is engaged in the business of

_____

AND WHEREAS THE Second Party is engaged in the business of

_____

AND WHEREAS both the parties are desirous of entering into a joint venture /consortium for carrying on the work of Syama Prasad Mookerjee Port, Kolkata in connection with work of_____(please mention the work of the tender).

AND WHEREAS the First Party and Second Party have agreed to form joint venture/consortium for execution of subject works.

NOW THIS DEED WITNESSED AS UNDER:

a. That under this Joint Venture/consortium Agreement the work will be done jointly by the first party and second party in the name and style of M/s_____.

b. It is further agreed by the Joint Venture/consortium Partner that _____of M/s._____has been nominated as Lead Partner for the execution of the works.

c. That all the parties shall be liable jointly, equally and severally for the satisfactory execution of the contract in all respect in accordance with terms and conditions of the contract and the lead partner shall be authorised to incur liabilities and receive instruction for and on behalf of any and all the partners and parties of the Joint Venture/consortium and the entire execution of the contract including payment shall be done exclusively with the lead partner.

d. THE PROPOSED PARTICIPATION SCOPE OF ACTIVITIES TO BE PERFORMED AND RESPONSIBILITIES OF EACH:

The proposed administrative arrangement, participation, scope of activities to be performed and responsibilities for the execution of the work of the each party shall be as under:

First Party:

Second Party:

e. The turnover and experience of each party is as under:

First Party:

Second Party:

f. Subject to Cluase-4, the parties shall depute their experienced staff as required for the works and plants, equipment, machinery etc. as requires for execution of works, will be deployed by each Joint Venture/consortium partners for execution of the contract.

g. In the event of default by any partner in the execution of the part of the contract, the Lead Partner will have the authority to assign the work to any other party acceptable to the Syama Prasad Mookerjee Port, Kolkata to ensure the satisfactory execution of that part of the contract.

h. The Registered Office of the Joint Venture/Lead Partner of the consortium shall be at _____

i. The Joint Venture/consortium shall regularly maintain in the ordinary course of business a true and correct account of all its incoming and outgoing and also of its assets and liabilities in proper books or account which shall ordinarily be kept at place of business and after Completion of above mentioned work all account shall be taken.

j. Opening and operation of Bank Account:

The Joint Venture/consortium shall open and maintain bank account(s) at_____The Lead Partner as mentioned in Clause (2) above shall have the power to receive the payments on behalf of the Joint Venture/consortium and to give discharge on behalf of the Joint Venture/consortium.

IN WITNESS WHEFEOF the Parties hereto have signed hereunder at_____on this_____day of _____

Party of First Part Party of Second Part

Witness:

1)

2)

POWER OF ATTORNEY

Format For Power Of Attorney For Lead Member Of Consortium

(To be executed before Notary Public on a Non-Judicial Stamp Paper of at least Rs 10)

Dated: .....

TO WHOMSOEVER IT MAY CONCERN Mr…….(Name of the Person(s)), domiciled at ……
(Address), acting as……(Designation and name of the company), and whose signature is attested below, is hereby appointed as the Lead member and authorised on behalf of -- -
-(Name of the applicant) to provide information and respond to enquiries etc. as may be required by the Employer for the project of (Project title)…….....and is hereby further authorised to sign and file relevant documents in respect of the above.

(Attested signature of Mr……..) For……
(Name & designation of the member of joint venture/Consortium)

- Individual power of attorney for signing the joint venture/Consortium shall be submitted in the above format separately by each applicant.

POWER OF ATTORNEY

Format For Power Of Attorney For Lead Member Of Consortium

(To be executed before Notary Public on a Non-Judicial Stamp Paper of at least Rs 10)

POWER OF ATTORNEY

Whereas, **Syama Prasad Mookerjee Port, Kolkata (SMPK)** ("the Authority") has invited tenders from interested parties for "..... " (Tender No).

Whereas, ……, ……, …… And ..... (collectively the "Consortium") being members of the Consortium are interested in bidding for the Tender in accordance with the terms and conditions of the Tender Document and other connected documents in respect of the said tender, and

Whereas, it is necessary under the Tender Document for the members of the Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium's bid for the Tender and its execution.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, M/s. …… having our registered office at ..... , M/s…… having our registered office at ……., M/s. ……. having our registered office at ……., and M/s. ..... having our registered office at ……., [the respective names and addresses of the registered office] (hereinafter collectively referred to as the "Principals") do hereby designate, nominate, constitute, appoint and authorize M/s. ……. having its registered office at....., being one of the members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the "Attorney"). We hereby irrevocably authorize the Attorney to conduct all business for and on behalf of the Consortium and any one of us during the bidding process and, in the event the Consortium is awarded the Contract, during the execution of the contract, and in this regard, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the pre- qualification of the Consortium and submission of its bid(s) for the tender, including but not limited to signing and submission of all applications, bids and other documents and writings, participate in Pre Bid and other conferences/meetings, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of bid(s) of the Consortium and generally to represent the Consortium in all its dealings with the Authority, and/or any other Government

Agency or any person, in all matters in connection with or relating to or arising out of the Consortium's bid(s) for the tender and/or upon award thereof till the Agreement is entered into with the Authority.

AND hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us / Consortium.

IN WITNESS HEREOF WE HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS ……

DAY OF 2021

For ……

……..

(Name & Title)

For ……

…….

(Name & Title)

For ……

…….

(Name & Title)

Witnesses:

1.

2.

……

(To be executed by all the members of the Consortium)

Format of Joint Bidding Agreement

(To be executed on Non-Judicial Stamp Paper of not less than Rs 100/-)

THIS JOINT BIDDING AGREEMENT is entered into on this the..... day of..... 20…

AMONGST

1. { ..... Limited, a company incorporated under the Companies Act, 1956} and having its registered office at …… (hereinafter referred to as the "**First Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

2. { ..... Limited, a company incorporated under the Companies Act, 1956} and having its registered office at …… (hereinafter referred to as the "**Second Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)

AND

3. { ..... Limited, a company incorporated under the Companies Act, 1956 and having its registered office at …… (hereinafter referred to as the "**Third Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)}

AND

4. { ..... Limited, a company incorporated under the Companies Act, 1956 and having its registered office at …… (hereinafter referred to as the "**Fourth Part**" which expression shall, unless repugnant to the context include its successors and permitted assigns)}

   The above-mentioned parties of the FIRST, SECOND, {THIRD and FOURTH} PART are collectively referred to as the **"Parties"** and each is individually referred to as a **"Party**"

WHEREAS,

A. [**Syama Prasad Mookerjee Port, Kolkata (SMPK)**, a Special Purpose Vehicle (SPV) with share of **Syama Prasad Mookerjee Port, Kolkata (SMPK)** and Govt. Of West Bengal is in the ratio of **74:26** (hereinafter to be called the Authority) and having Principal Office at 15, Strand Road, Kolkata-700001 (hereinafter referred to as the "**Syama Prasad Mookerjee Port, Kolkata (SMPK)**" which expression shall, unless repugnant to the context or meaning thereof, include

its administrators, successors and assigns) has invited offers by its Request through NIT No. …… dated ……(the "**TENDER DOCUMENT**") for selection of successful tenderer for the contract as proposed in the said tender document.

B. The Parties are interested in jointly bidding for the Project as members of a Consortium and in accordance with the terms and conditions of the tender document and other documents in respect of the work, and

C. It is a necessary condition under the tender document that the members of the Consortium shall enter into a Joint Bidding Agreement and furnish a copy thereof with the Offer.

NOW IT IS HEREBY AGREED *as follows:*

1. Definitions and Interpretations

In this Agreement, the capitalised terms shall, unless the context otherwise requires, have the meaning ascribed thereto under the tender document.

2. Consortium

2.1. The Parties do hereby irrevocably constitute a consortium (the "**Consortium**") for the purposes of jointly participating in the Tendering Process for the Work.

2.2. The Parties hereby undertake to participate in the Tendering Process only through this Consortium and not individually and/ or through any other consortium constituted for this work, either directly or indirectly or through any of their Associates.

3. Covenants

The Parties hereby undertake that in the event the Consortium is declared the successful tenderer and awarded the contract, it shall incorporate a special purpose vehicle (the "**SPV**") under the Indian Companies Act 1956 for entering into an Agreement with the SMPK and for performing all its obligations as the successful tenderer in terms of the Agreement for the Project.

4. Role of the Parties

The Parties hereby undertake to perform the roles and responsibilities as described below:

a) Party of the First Part shall be the Lead member of the Consortium and shall have the power of attorney from all Parties for conducting all business for and on behalf of the Consortium during the tendering process and till all the obligations of the SPV shall become effective;

(a) Party of the Second Part shall be {the Technical Member of the Consortium}

(b) {Party of the Third Part shall be the Financial Member of the Consortium; and}

(c) {Party of the Fourth Part shall be the Operation and Maintenance Member/ Other Member of the Consortium.}

[Note: Status of the members in (b), (c) and (d) are only illustrative. More / less parties may form the Consortium and changes may be made accordingly to the JBA]

5. Joint and Several Liability

The Parties do hereby undertake to be jointly and severally responsible for all obligations and liabilities relating to the work and in accordance with the terms of the tender document till completion of the contract.

6. Shareholding in the SPV

6.1. The Parties agree that the proportion of shareholding among the Parties in the SPV shall be as follows:

First Party:

Second Party:

{Third Party:}

{Fourth Party:}

6.2. The Parties undertake that a minimum of 26% (twenty-six per cent) of the subscribed and paid up equity share capital of the SPV shall, at all times till completion of two years from the date of commencement of the contract, be held by the Parties of the First, {Second and Third} Part whose experience and net-worth have been reckoned for the purposes of pre- qualification in terms of the tender document.

6.3. The Parties undertake that they shall collectively hold at least 51% (fifty-one per cent) of the subscribed and paid up equity share capital of the SPV at all times till completion of two years from the date of commencement of the contract.

6.4. The Parties undertake that they shall comply with all the requirements as stipulated in the tender document vide N.I.T. No. ……dated …….

7. Representation of the Parties

Each Party represents to the other Parties as of the date of this Agreement that:

a) Such Party is duly organized, validly existing and in good standing under the laws of its incorporation and has all requisite power to enter into this Agreement with KoPT;

b) The execution, delivery and performance by such Party of this Agreement has been authorised by all necessary and appropriate corporate or governmental action and a copy of the extract of the charter documents and board resolution/ power of attorney in favour of

the person executing this Agreement for the delegation of power and KoPT to execute this Agreement on behalf of the Consortium Member is annexed to this Agreement, and will not, to the best of its knowledge:

i. Require any consent or approval not already obtained;

ii. Violate any Applicable Law presently in effect and having applicability to it;

iii. Violate the memorandum and articles of association, by-laws or other applicable organizational documents thereof;

iv. Violate any clearance, permit, concession, grant, license or other governmental authorization, approval, judgment, order or decree or any mortgage agreement, indenture or any other instrument to which such Party is a party or by which such Party or any of its properties or assets are bound or that is otherwise applicable to such Party; or

v. Create or impose any liens, mortgages, pledges, claims, security interests, charges or Encumbrances or obligations to create a lien, charge, pledge, security interest, encumbrances or mortgage in or on the property of such Party, except for encumbrances that would not, individually or in the aggregate, have a material adverse effect on the financial condition or prospects or business of such Party so as to prevent such Party from fulfilling its obligations under this Agreement;

c) this Agreement is the legal and binding obligation of such Party, enforceable in accordance with its terms against it; and

d) there is no litigation pending or, to the best of such Party's knowledge, threatened to which it or any of its Affiliates is a party that presently affects or which would have a material adverse effect on the financial condition or prospects or business of such Party in the fulfilment of its obligations under this Agreement.

8. Termination

This Agreement shall be effective from the date hereof and shall continue in full force and effect until the Financial Close of the contract is achieved under and in accordance with the terms of the tender, in case the contract is awarded to the Consortium. However, in case the Consortium is either not pre-qualified for the work or does not get selected for award of the contract, the Agreement will stand terminated in case the Tenderer is not pre-qualified or upon return of the Earnest Money by the SMPK to the Bidder, as the case may be.

9. Miscellaneous

9.1. This Joint Bidding Agreement shall be governed by laws of India.

9.2. The Parties acknowledge and accept that this Agreement shall not be amended by the Parties without the prior written consent of the **Syama Prasad Mookerjee Port, Kolkata (SMPK),**

IN WITNESS WHEREOF THE PARTIES ABOVE NAMED HAVE EXECUTED AND DELIVERED THIS AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

SIGNED, SEALED AND DELIVERED	SIGNED, SEALED AND DELIVERED
For and on behalf of	For and on behalf of
LEAD MEMBER by:	SECOND PART by
(Signature)	(Signature)
(Name)	(Name)
(Designation)	(Designation)
(Address)	(Address)

SIGNED, SEALED AND DELIVERED	SIGNED, SEALED AND DELIVERED
For and on behalf of	For and on behalf of
THIRD PART by:	FOURTH PART by
(Signature)	(Signature)
(Name)	(Name)
(Designation)	(Designation)
(Address)	(Address)

In the presence of:

1. 2.

Notes*:*

1. The mode of the execution of the Joint Bidding Agreement should be in accordance with the procedure, if any, laid down by the Applicable Law and the charter documents of the executants (s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.
2. Each Joint Bidding Agreement should attach a copy of the extract of the charter documents and documents such as resolution / power of attorney in favour of the person executing this Agreement for the delegation of power and SMPK to execute this Agreement on behalf of the Consortium Member.
3. For a Joint Bidding Agreement executed and issued overseas, the document shall be legalized by the Indian Embassy and notarized in the jurisdiction where the Power of Attorney has been executed.

Integrity Pact

Between

Syama Prasad Mookerjee Port, Kolkata (KoPT) hereinafter referred to as "**The Principal/ Employer**".

And

…….. herein after referred to as "**The Bidder/Contractor**"

Preamble

The Principal intends to award, under laid down organizational procedures, contract/s for .....The Principal values full compliances with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relations with its Bidder(s) and/or Contractor(s).

In order to achieve these goals, an Independent External Monitor (IEM) appointed by the principal, will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to: -

Enabling the PRINCIPAL/EMPLOYER to get the contractual work executed and/or to obtain/dispose the desired said stores/ equipment at a competitive price in conformity with the defined specifications/ scope of work by avoiding the high cost and the distortionary impact of corruption on such work /procurement/ disposal and Enabling BIDDERs/ CONTRACTORs to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the PRINCIPAL/EMPLOYER will commit to prevent corruption, in any form, by its officials by following transparent procedures.

Section 1 – Commitments of the Principal/ Employer.

(1) The Principal commits itself to take measures necessary to prevent corruption and to observe the following principles:

a. No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.
b. The Principal will, during the tender process treat all Bidder(s) with equity and reason. The Principal will, in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential/ additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.
c. The Principal will exclude from the process all known prejudiced persons.

(2). If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal Code (IPC)/Prevention of Corruption (PC) Act, or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can initiate disciplinary actions.

Section-2 –Commitments of the Bidder(s) / Contractor(s)

(1) The Bidder(s)/Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the tender process and during the contract execution.

a. The Bidder(s) /Contractor(s) will not directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.

b. The Bidder(s)/Contractor(s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contract, submission or non-submission of bids or any other actions to restrict competitiveness or to introduce cartelization in the bidding process.

c. The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act; further the Bidder(s)/Contractor(s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

d. The Bidder(s)/Contractor(s) of foreign origin shall disclose the name and address of the Agents/representatives in India, if any. Similarly, the Bidder(s)/Contractor(s) of Indian Nationality shall furnish the name and address of the foreign principles,

if any. Further details as mentioned in the "Guidelines on Indian Agents of Foreign Suppliers" shall be disclosed by the Bidder(s)/Contractor(s). Further, as mentioned in the Guidelines, all the payments made to the Indian agent/representative have to be in Indian Rupees only. Copy of the "Guidelines on Indian Agents of Foreign Suppliers" is annexed and marked as Annex-A.

e. The Bidder(s)/Contractor(s) will when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract.

(2). The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

Section-3-Disqualification from tender process and exclusion from future contracts

If the Bidder(s)/Contractor(s) before award or during execution has committed a transgression through a violation of Section 2 above, or in any other form such as to put his reliability or credibility in question, the Principal is entitled to disqualify the Bidder(s)/Contractor(s) from the tender process or take action as considered appropriate.

Section 4-Compensation for damages

(1) If the Principal has disqualified the Bidder(s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit/Bid Security.

(2) If the Principal has terminated the contract according to Section 3 or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages of the contract value or the amount equivalent to Performance Bank Guarantee.

Section 5-Previous transgression

(1) The Bidder declares that no previous transgressions occurred in the last 3 years from the date of signing the Integrity pact with any other Company in any country conforming to the anti corruption approach or with any other Public Sector Undertaking / Enterprise in India, Major Ports/ Govt. Departments of India that could justify his exclusion from the tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or action can be taken as considered appropriate.

Section 6- Equal treatment of all Bidders/Contractors/Sub-Contractors

(1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact, and to submit it to the Principal before contract signing.

(2) The Principal, will enter into agreements with identical conditions as this one with all Bidders, Contractors and Sub-contractors.

(3) The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7- Other Legal actions against violating Bidder(s)/ Contractor(s)/ Sub Contractor(s)

The actions stipulated in this Integrity pact are without prejudice to any other legal action that may follow in accordance with provisions of the extant law in force relating to any civil or criminal proceedings.

Section 8 – Role of Independent External Monitor (IEM):

(a) The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this pact.

(b) The Monitors shall not be subject to instructions by the representatives of the parties and shall perform their functions neutrally and independently.

(c) Both the parties accept that the Monitors have the right to access all the documents relating to the contract.

(d) As soon as the Monitor notices, or has reason to believe, a violation of this pact, he will so inform the authority designated by the Principal and the Chief Vigilance Officer of Kolkata Prot Trust.

(e) The BIDDER/ CONTRACTOR(s) accepts that the Monitor has the right to access without restriction to all contract documentation of the PRINCIPAL including that provided by the BIDDER/ CONTRACTOR. The BIDDER/ CONTRACTOR will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his contract documentation, if any. The same is applicable to sub-contractors. The Monitor shall be under contractual obligation to treat the information and documents of the Bidder/Contractor/ Sub-contractor(s) with confidentiality.

(f) The Principal/ Employer will provide to the Monitor sufficient information about all meetings among the parties related to the contract provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor, the option to participate in such meetings.

(g) The Monitor will submit a written report to the designated Authority of Principal/ Employer/ Chief Vigilance Officer of Syama Prasad Mookerjee Port, Kolkata within 8 to 10 weeks from the date of reference or intimation to him by the Principal/ Employer/ Bidder/ Contractor and should the occasion arise, submit proposals for correcting problematic situation. BIDDER/ CONTRACTOR can approach the Independent External Monitor (s) appointed for the purposes of this Pact.

(h) As soon as the Monitor notices, or believes to notice, a violation of this agreement, he will so inform the Management of the Principal and request the Management to discontinue or to take corrective action, or to take other relevant action. The Monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.

(i) If the Monitor has reported to the Principal substantiated suspicion of an offence under the relevant IPC/PCA, and the Principal/ Employer has not, within reasonable time, taken visible action to proceed against such offence or reported to the Chief Vigilance Officer, the Monitor may also transmit this information directly to the Central Vigilance Commissioner, Government of India.

(j) The word 'Monitor' would include both singular and plural.

8.The Name and Correspondence Particulars of Independent External Monitors:

a) Shri Subhashish Sarkar,
Flat No. 406, Block-III,
Kirti Apartments,
Mayur Vihar Phase-I Extension,
Delhi-110 091,
Mob No. 98117 07230,
E-mail ID- subhashishsarkar53@yahoo(dot)com

b) Ms. Bulbul Sen, IRS (Retd.),
B-104 Nayantara Aptts.
Block 8B, Sec - 7
Dwarka
New Delhi-110075
E-mail ID- bsensarkar@gmail.com

Section 9 – Facilitation of Investigation:

In case of any allegation of violation of any provisions of this Pact or payment of commission, the PRINCIPAL/EMPLOYER or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER/CONTRACTORS and the BIDDER/CONTRACTOR shall provide necessary information and documents **in English** and shall extend all possible help for the purpose of such examination.

Section 10 – Pact Duration:

The pact beings with when both parties have legally signed it and will extend upto 2 years or the complete execution of the contract including warranty period whichever is later. In case bidder/contractor is unsuccessful this Integrity Pact shall expire after 6 months from the date of signing of the contract.

If any claim is made/lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by Chairman, KoPT.

Section 11 – Other Provisions:

(1) This agreement is subject to Indian Law. Place of performance and jurisdiction is the Registered Office of the Principal in Kolkata.

(2) Changes and supplements as well as termination notices need to be made in writing in English.

(3) If the Contractor is a partnership or a consortium, this agreement must be signed by all partners or consortium members.

(4) Should one or several provisions of this agreement turn out to be invalid, the reminder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

_____	_____
(For & on behalf of the Principal)	(For & on behalf of Bidder/Contractor).
(Office Seal)	(Office Seal)

Place: -

Date: -

Witness 1:

(Name & Address) ……..

……

……

Witness 2:

(Name & Address) ……

……..

…….

ANNEXURE-A

GUIDELINES FOR INDIAN AGENTS OF FOREIGN SUPPLIERS

1.1 There shall be compulsory registration of Indian agents of Foreign suppliers for all Tenders. An agent who is not registered with KoPT shall apply for registration in the prescribed Application-Form.

1.2 Registered agents will file an authenticated Photostat copy (duly attested by a Notary Public)/Original certificate of the principal confirming the agency agreement and giving the status being enjoyed by the agent and the commission/ remuneration/salary/retainer ship being paid by the principal to the agent before the placement of order by KoPT.

1.3 Wherever the Indian representatives have communicated on behalf of their principals and the foreign parties have stated that they are not paying any commission to the Indian agents, and the Indian representative is working on the basis of salary or as retainer, a written declaration to this effect should be submitted by the party (i.e. Principal) before finalizing the order.

2.0 DISCLOSURE OF PARTICULARS OF AGENTS/REPRESENTATIVES IN INDIA. IF ANY.

2.1 Tenderers of Foreign nationality shall furnish the following details in their offer:

2.1.1 The name and address of the agents/representatives in India, if any and the extent of authorization and authority given to commit the Principals. In case the agent/representative be a foreign Company, it is to be conformed whether it is real substantial Company and details of the same shall be furnished.

2.1.2 The amount of commission/ remuneration included in the quoted price(s) for such agents/ representatives in India.

2.1.3 Confirmation of the Tenderer that the commission/remuneration if any, payable to his agents/ representatives in India, is to be paid by KoPT in Indian Rupees only.

2.2 Tenderers of Indian Nationality shall furnish the following details in their offers:

2.2.1 The name and address of the foreign principals indicating their nationality as well as their status, i.e. whether manufacturer or agents of manufacturer holding the Letter of Authority of the Principal specifically authorizing the agent to make an offer in India in response to tender either directly or through the agents /representatives.

2.2.2 The amount of commission/remuneration included in the price(s) quoted by the Tenderer for himself.

2.2.3 Confirmation of the foreign principals of the Tenderer that the commission/remunerations, if any, reserved for the Tenderer in the quoted price(s), is to be paid by KoPT in India in equivalent Indian Rupees.

2.3 In either case, in the event of contract materializing, the terms of payment will provide for payment of the commission/remuneration, if any payable to the agents/representatives in India in Indian Rupees on expiry of 90 days after the discharge of the obligations under the contract.

2.4 Failure to furnish correct and detailed information as called for in paragraph-2.0 above will render the concerned tender liable for rejection or in the event of a contract materializing, the same liable to termination by KoPT. Besides this there would be a penalty of banning business dealings with KoPT or damage or payment of a named sum.

THE BOARD OF TRUSTEES FOR SYAMA PRASAD MOOKERJEE PORT,KOLKATA

FORM OF TENDER

To

The Chief Engineer, KDS

Syama Prasad Mookerjee Port, Kolkata.

I/We_____having examined the site of work, inspected the Drawings and read the specifications, General & Special Conditions of Contract and Conditions of the Tender and all other documents hereby tender and undertake to execute and complete all the works required to be performed in accordance with the Specification, Bill of Quantities, General & Special Conditions of Contract and Drawings prepared by or on behalf of the Trustees and at the rates & prices set out in the annexed Bill of **Quantities for 18 (Eighteen) Months** from the date of order to commence the work and in the event of our tender being accepted in full or in part. I / We also undertake to enter into a Contract Agreement in the form hereto annexed with such alterations or additions thereto which may be necessary to give effect to the acceptance of the Tender and incorporating such Specification, Bill of Quantities, Drawing and Special & General Conditions of Contract and I / We hereby agree that until such Contract Agreement is executed the said Specification, Bill of Quantities, Conditions of Contract and the Tender, together with the acceptance thereof in writing by or on behalf of the Trustees shall be the Contract.

THE TOTAL AMOUNT OF TENDER Rs. **Not to be mentioned here**

(Repeat in words) _____**Not to mention here** _____

I / We require _____days / months preliminary time to arrange and procure the materials required by the work from the date of acceptance of tender before I We could commence the work.

I / We have deposited with the Trustees' FA&CAO, SMP, Kolkata vide Receipt No. _____ of _____ as Earnest Money.

I / We agree that the period for which the tender shall remain open for acceptance shall not be less than 180 days from the opening date of technical bid.

Dated: (Signature of Bidder with Seal)

Name of the Bidder:

Address:

Pre-Bid Query Format

Tender Notice No.: SMPK/KDS/CIV /T/2622/60 **Dt. 29.10.2021**

Name of Work :- E-tendering for **'DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACK YARD AT N.S. DOCK, KDS, SMP,KOLKATA"**

Queries raised by **M/s ……**

Sr. No	**Reference of Tender Document/Brief clause**		**Requirement by the bidder Clarification requested**	Reply of SMPK
	Ref.	**Brief clause of Tender Document**		

CHECK LIST TO THE TENDER SCHEDULE

(For documents to be submitted by the tenderers for acceptance of the tender)

1. Bid Security Declaration --Submitted/NA

2. Cost of tender schedule --Submitted /NA

3. (a) Proof of experience in executing similar nature of works completed during last 7 years. --Submitted/NA
(Similar completed works should be,

3(three) works each costing not less than Rs **30.59 Crores**
(or)
2(two) works each costing not less than Rs **38.24 Crores**
(or)
1(one) work costing not less than Rs 61**.18 Crores**

(b) Proof of average annual turnover should be not less than **Rs.22.94 Crores** --Submitted / NA during last 3 years duly certified by the Chartered Accountant verified with UDIN.

4. Proof of valid solvency i.e., validity within one year -- Submitted / NA
(Amount as mentioned in the Tender Notice)
AND
5. All documents as per Annexure -D

6. Section 12 of Bidding Document (To be submitted in Part-II) -- Submitted / NA

NOTE:

(1) The Check List should be signed and submitted by the Tenderers along with their Tenders, duly-confirming that they submit the above-mentioned documents.

(2) The tenders received without Check List duly signing & enclosing and required documents as per the Check List will be liable for rejection.

PART C- TECHNICAL BID

SECTION – 7

TIME SCHEDULE

TIME SCHEDULE

The Intended completion Date for the whole of the Work is **18 months** with the following milestones:

S.No	Description of Work	Time in months	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
1	Design & Engineering (submission & approval)	2	1	2																
2	Dismantling & Excavation & start of procurement	3			1	2	3													
3	Construction of Berthing structure with pile foundation & sheet pile, beam , slab, rail fixing for RMQC etc. Including necessary field test & laboratory test as required	13				1	2	3	4	5	6	7	8	9	10	11	12	13		
4	Ground improvement & yard construction (Geosynthetic stratum with RC slab top / paver block)	8						1	2	3	4	5	6	7	8	9	10	11		
5	Marine fixtures (installation & procurement)	11												1	2	3	4	5	6	
6	Provision for miscellaneous works	2																1	2	
7	Site cleaning and handing over	1																		1
Timeline shown above is tentative in nature																				

SECTION – 8

SITE CONDITION AND SPECIFICATIONS

SYAMA PRASAD MOOKERJEE PORT, KOLKATA

Civil Engineering Department

….

1.	**Scope of Work**		
		1.1	Reconstruction of old 7 NSD berth of size 182.2 m x 26.75 mafter demolition of old berth structure to be constructed on insitu bored piles, which will rest on pile muff and necessary beam slab combination and Development of stack yard after dismantling old structures behind the 7 NSD berth at an areaof 182.2 m x 61.95 m with paver block topping. For design of the berth following datas are given:
			1) The berth structure will rest on pile muff with necessary beam-slab combination for operation of MHC of LHM425 & RMQC. 2) Maximum Vessel size 172 mtr. X 25 mtr with DWT 18000 ton. 3) Scour depth - The berth is housed in impounded dock basin, thus there is no impact of river current and the basin is in tranquil state. 4) Level : The top level of 7 NSD berth is at a level +7.32 m KODS while the dredge bed level of dock basin is 5.18 m. KODS. The dock level water varies from +5.33 m KODS to + 5.18 m. Incidentally the KODSlevel is 2.82 m below MSL. 5) Angle of berthing : As per IS 4651, part-III. 6) Velocity of approach : As per IS 4651, part-III. 7) Geotechnical data : Recent soil investigation report of site is attached. 8) Berthing force is to be considered as per IS 4651, part-III. 9) Dia. of Pile will be 1200 mm & Cut off length of Pile will be (-)35.00 m,KoDS. 10) RCC to be used will not be below M-40 grade. 11) PCC to be used will not be below M-20 grade.

			12) The reinforcement to be used high yield deformed barof grade Fe500D or Equivalent. 13) Construction of Service Trench of 1200mm x 1200mm throughout the periphery both of berth and stacking yard duly provided with heavy duty RCC covers framed with MS Angle 150mm x 150mm x 8mm, whenever necessary. 14) Supplying and fixing mild steel liners for pile of required size 8 mm thick along with 12mm stiffener plate of 300mm width to be provided at required level or strata as per the site requirement or as directed by the Engineer-in- Charge (EIC). 15) Providing 25mm thick Expansion Joints at the Junction of the deck units in superstructure with 25 mm thick bitumen impregnated fibre board in the gaps of expansion joints to full depth including water sealant at top and bottom filling with joint sealing compound at top. 16) Providing and fixing marine fixtures such as SCN 1000H type rubber fender of reputed make like Bridge Stone etc, Stag horn CI bollards of 60T capacity ,Anchor Bolts, Mooring rings, moulded rubber ladders, Safety Chains, D-shackles etc. 17) Providing crane track including check rail for RMQC track with 60kg rails on cement concrete bed, fixing to position by holding down bolts and positioning of check rail inside, jointing, check bolting with check blocks, washers, cutting of rails, maintaining gauge, levelling etc., including all accessories and foundation etc. 18) Necessary foundation of high mast tower at specified position for proper illumination of berth and stack yard 19) Erection and drive of Z-section Sheet Pile (A Z18). to separate the berth area and stacking yard . 20) Relevant Indian ISI, IRC and International codes to be used for the design of berth . Uniform distributed live load of 5 T/Sqm. to be considered.
		1.2	For design of Stack Yard:

			1) The stack yard is to be designed for five high 20 tonnes /40 tonnes container with live load. 2) Rich stacker and container trailer will operate on the yard. 3) The ground development of the yard will have to be made with geo-synthetic stratum mattresses with necessary granular layer, PCC with paver block topping. 4) The grade of paver block should not be less than M- 50 grade.
			5) The design should be based on Relevant IS code of latest edition &AASTHO. Other International code are to be used where IS code is not available.
2.	**Insure For Performance**		The Tenderer to insure with an insurance company for the whole work order amount for a period of 10 years from the date of completion of the work to take care of all risks for satisfactory operations on the Berth No 7, NSD, Kolkata. The bidder shall submit a Bank Guarantee for the Premium Amount payable annually for the entire period of 10 years.
3.	**Details of Existing Berth No. 7, NSD, Kolkata**		Old Berth No 7 had been constructed on 22-inch dia. franky piles founded in alluvial soil, on pile muff with RCC beam slabs combination etc. The age of existing berth is more than 60 years. It is also to be mentioned that due to ageing effect & continuous mechanical operations over it, its structural member had under gone spalling of concrete, development of cracks, corrosion in reinforcement etc. As a result a portion of Jetty collapsed/ damaged in Feb-2018. Now the berth has to be dismantled before new construction.
4.	**Location**		NETAJI SUBHAS DOCK (NSD) AT KOLKATA DOCK SYSTEM (KDS) OF SYAMA PRASAD MOOKERJEE PORT,KOLKATA. (Formerly known as Kolkata Port Trust).
5.	**Design Requirements**		The berth & Stack Yard design shall be based on the detailed survey and soil investigation data (already given) and other relevant data already mentioned. The drawings prepared on the basis of these design along with the drawings required shall from part of the tender document. Detail Design Report and Drawings shall be submitted to the PMC and Engineer in Charge,KDS, SMPK for review, comments and approval first. The work shall have to be carried out in accordance with these approved drawings and such other additional drawings prepared or modified as per comments of PMC and Engineer in Charge of KDS, SMP,Kolkata.
		5.1	The bidder to adopt Layout as proposed by the PMC and SMP for the berth & Stack Yard construction.
		5.2	Design Criteria: The work to be executed should be as per relevant Codes of Bureau of Indian Standards, in the absence of which other relevant International standard (ASTM & British Standards) may be followed. The data already mentioned are strictly to be used in designing the berth and stack yard structure.
		5.2.1	

			I. For MHC Standard load of LHM-425 is to be considered. II. **Rail Mounted Quay Crane (RMQC),** 40 T lifting capacity under Spreader at 40 m outreach with compliance of FEM and DIN EN standards. III. Uniformly Distributed load of 5 tonnes per Sqm. on the wharf.
		5.2.2	**Lateral Load:**
			i) <u>Earth Pressures</u>**:** Due to soil in contact with the structures including the effect of surcharge loading of 5 tonnes per Sqm. Behind the berth. For Computation of earth pressure, the soil parameters should be taken. ii) <u>Berthing Impact:</u> Berthing force is to be considered as per IS 4651, part-III. iii) Vessel Dimensions: Vessels of size DWT 25500 MT, LOA 172 mts. Beam 25 mts. Drought 8.5 mts., Berthing Velocity and Berthing angle as per IS 4651, part-III. Iv) Bollard Pull: 60 tonnes on each of the Bollards to act simultaneously on all the bollards of every unit of berth from joint to joint. v) Seismic force as per relevant IS Code. vi) The effect of temperature on Shrinkage forces. vii) Permissible Stresses, partial safety factors for loads as per IS:4651.
		5.2.3	**Sub-Structure:**
			Limit State Method of Design is to be adopted and Partial Safety Factors of Materials and Loads should be as follows:
			i) <u>Partial Safety Factor for Strength of Concrete</u>: 1.5 ii) <u>Allowable Stresses in Steel</u>: a) Under Factored Load Conditions- 250 N/sqmm b) Under Working Load Conditions- 165 N/sqmm. iii) <u>Load Factors:</u> a) DL, LL and Earth Pressure- 1.5 b) 15% increase in allowable stress in steel is allowed while designing the dock system for load combination of 1.5 (DL+LL+EP). c) Surface Crack width is limited to 0.004 times to clear cover to the main reinforcement. d) Minimum M40 Grade of Concrete & Fe 500D Grade of Steel reinforcement are to be used. e) Minimum reinforcement in Piles shall be 0.8% of the cross-sectional area of that Pile.
		5.2.4	**Super-Structure:**
			Limit State Method of Design is to be adopted and Partial Safety Factors of Materials and Loads should be as follows:

			i) Partial Safety Factor for Strength of Concrete: 1.5 ii) Allowable Stresses in Steel: a) Under Factored Load Conditions- 250 N/sqmm. b) Under Working Load Conditions- 165 N/sqmm. iii) Load Factors: a) DL, LL and Earth Pressure- 1.5 b) 15% increase in allowable stress in steel is allowed while designing the dock system for load combination of 1.5 (DL+LL+EP). c) Surface Crack width is limited to 0.004 times to clear cover to the main reinforcement. d) Minimum M40 Grade of Concrete & Fe500D Grade of reinforcement are to be used. e) Expansion Joints in the Structure should be provided as per relevant IS Code.
6.	**Design of Structures**		
		6.1	**General:**
			i) The complete structure shall be designed to be safe against collapse and to maintain at all timesand acceptable serviceability level. These shall also be designed to be durable to withstand the deteriorating effect of the climate and environment. It is further agreed that any failure or omission of the PMC to review and/or comment hereunder shall not be construed or deemed as acceptance of any such agreement or document by the Authority. No review and/ or observation of the PMC and / or its failure to review and/ or covey its observations on any document/ drawing shall relieve the bidder of its obligations and liabilities under tis contract agreement in any manner nor shall the Authority be liable for the same in any manner whatsoever. ii) The bidder is encouraged to adopt innovative / latest techniques in design, construction and use of new materials special Green concrete. However, in all such cases bidder shall submit all the relevant details along with guidelines and proprietary literature proposed to be followed to PMC/SMPK Authority for review and comment. It is further agreed that anyfailure or omission of the PMC to review and/or comment hereunder shall not be construed or deemed as acceptance of any such agreement ordocument by the Authority. No review and/ or observation of the PMC and / or its failure to review and/ or covey its observations on any document/ drawing shall relieve the bidder of its obligations and liabilities under this contract agreement in any manner nor shall the SMPK Authority be liable for the same in any manner

			whatsoever.
		6.2	**Type of Structure:**
			i) The bidder shall submit the designs for the structural system proposed which is in the Tender. Design and layout of the structures shall be suitable for the soil / site condition of the proposed location. ii) The Sub-structure, Superstructure and Foundation may be of reinforced concrete.
		6.3	**Analysis and Design of Structures:**
			All structures and their individual components shall be designed and developed as per latest relevant Indian Standard Codes depending upon the type of Structure/ individual component proposed to be provided. The minimum cross-sectional dimensions of each component shall be provided so as to satisfy the requirements specified in the relevant IS Codes and the Design shall be taken into account long term durability, serviceability, constructability, construction methodology and environmental factors. The earth retaining structure shall be designed for lateral earth pressure, surcharge and hydrostatic pressures and other horizontal loads.
		6.4	**Design Report and Drawings:**
			The Tenderer shall furnish detailed designs and drawings for each component of the project such as Layout Plan, Berth Structures, Drainage, Fixtures and other user facilities etc., as per the requirements specified to the PMC/Engineer in Charge for their review and comments, if any in both soft and Hard copy. It is further agreed that any failure or omission of the PMC to review and/or comment hereunder shall not be construed or deemed as acceptance of any suchagreement or document by the Authority. No review and/ or observation of the PMC and / or its failure to review and/ or convey its observations on any document/ drawing shall relieve the bidder of its obligations and liabilities under this contract agreement in any manner nor shall the Authority be liable for the same in any manner whatsoever.

7.	**Materials**		
		7.1	**Natural Materials:**
			Physical requirement of earth, sand, gravel and aggregates shall confirm to the requirements of the provisions of the relevant Indian Standards. Natural aggregates when crushed and blended for various uses different size frictions shall be proportioned to form grading conforming to the to the requirements of the relevant Indian Standards as are relevant to the intended use of the materials.
		7.2	**Processed Materials:**
		7.2.1	**Cement Concrete Mixes:**
			PCC and RCC shall be design mixes, in accordance with the provisions of latest IS-456. Concrete of M 40 grade or higher shall be used for the project, except for the levelling courses in foundations, where not lesser than M 20 grade to be used. Specific requirements of the mixes (such as Workability, W/c Ratio, use of Admixtures, Grades of Cement & Steel, Minimum & Maximum Cement content, Characteristic Strength of Concrete etc.) have to be as per latest IS Standards.
		7.3	**Manufactured Materials:**
		7.3.1	**Cement:**
			Ordinary Portland Cement of grade 33, 43 & 53 conforming to IS-269, IS-8112 and IS-12269 respectively or Portland Slag Cement conforming to IS-455 shall be used subject to the condition that the design cement content should not be less than 450 Kg/Cum and as per requirement of cement from durability considerations as provided. It is explicitely classified that the use of Portland Pozzolana Cement **shall not be** permissible for any Structural concrete work.
		7.3.2	**Steel:**
			High Yield Strength Deformed (HYSD) reinforcing bars of Fe 500D grade conforming to IS-1786. Expansion Joints, Anchor Bolts, Fenders, Bollards, Ladder shall meet the relevant provisions of the IS Codes, recommendations of the system providers, manufacturer testing and certification and the designer design assumptions. The bidder may use other construction materials for which a detailed design produced to be adopted shall be furnished to PMC and SMP, Kolkata for review and comments.
		7.4	**Additional Conditions Regarding Supply and Procurement of Cement & Steel:**
			SMP, Kolkata will not supply Cement & Steel. The Contractor shall procure steel and cement required for both permanent and temporary works unless specified otherwise and the materials shall comply with relevant IS Codes and given as below. Any wastage of Cement and steel including the consumption for temporary works shall be to the account of the Contractor (s) and the rate entered in the Contract shall cover the above aspects and **No Claim** will be entertained on these aspects .
		7.4.1	**Cement:**

			The Contractor (s) shall procure PSC & OPC conforming the relevant IS Codes (latest edition) as required for the work from approved manufacturers of cement having adequate production capacity as approved by the Ministry of Industries, Government of India and holding valid license to use ISI certification mark. Supply of Cement shall be taken in 50 Kg. HDPE Bags or by cement bulker bearing manufacturers name and ISI marking. Probable list of reliable suppliers may be enclosed to the Tender for cement and obtain approval of PMC & SMP, Kolkata. The

			responsibility for selection of proper manufacturers forgetting the desired strength of concrete shall however rest entirely with the Contractor .
			i) Each consignment of the cement to be brought at site shall be approximately 100 tons or as directed by the Engineer-in-Charge along with manufacturer's test certificate. ii) The Contractor (s) shall arrange testing of cement for each batch in accordance with provisions of relevant IS code and only to be tested from Govt. Authorised Laboratories or Reputed Technical Govt. Institute. The contractor should supply the Cement for free for lab-testing. The testing charge shall be borne by the Contractor (s) solely. In case the test result indicate that the cement arranged by the contractor does not conform the relevant IS Code, the same shall be rejected and removed from the site by the Contractor (s) at his own cost, within one-week time of written orders from the Engineer-in- Charge to do so and **no claim** whatsoever will beentertained in this regard. iii) The cement store-room shall be constructed by the contractor separately as per Indian Standard or as directed by Engineer-in-Charge, for which **no extra** payment can be claimed by the Contractor . The Contractor shall be responsible for the watch and ward and safety of the stored cement. The Contractor Shall facilitate the inspection of the cement store to the Engineer-in-charge & PMC at any time. iv) Manufacturer test certificate including bills corresponding to each lot shall be supplied with every consignment of cement. Base on the same but subject to test above, the cement shall be allowed to be used in the work in case of emergency. However, if the test results at (ii) above do not meet required strength, such cement shall be rejected and removed from the site. Concrete produced with such cement prior to rejection of cement shall be accepted only if the test results of the concrete are satisfactory. If the concrete test results are not satisfactory such work shall be rejected and the same shall be dismantled and redone by the Contractor athis own cost. v) The cement brought to the site and remained unused after completion of work shall not be removed from the site without prior written permission of the Engineer-in-Charge. vi) The actual issue and consumption of cement on work shall be regulated and proper account shall be maintained at site. vii) Any cement bag found damaged or torn or contains less than specified weight (i.e. 50 Kg/ Bag), shall be rejected. Also, if any consignment found defective, the Contractor have to remove that particular consignment from the site with immediate effect or as directed by the Engineer-in-Charge.
		7.4.2	**Steel:**

The Contractor shall procure Steel (both reinforcement & Structural) and Z section MS sheet pile required for the works both temporary and permanent including for all fixtures conforming to the

relevant IS Code from the main producers viz., **M/s VSP, M/s SAIL, M/s TISCO etc.** as approved by the Ministry of Steel, Govt. of India. The Contractor (s) shall obtain and furnish bills and valid test certificates to the Engineer-in- Charge in respect of all supplies of Steel brought by the Contractor to the site.

i) Steel Reinforcement Bars: The reinforced steel shall be HYSD Bars of Fe 500 D grade and shall meet the requirements as specified in relevant IS Code (Latest version).

ii) Structural Steel: The Structural steel viz., MS Plates, Channels, Joists, Flats, Angles etc., shall conform to IS:2062 (latest version). The steel shall be brought to the site in bulk supply of 10 tonnes or as directed by Engineer-in-Charge.

iii) The Mild steel bars shall conform to Grade- I of IS:432 Part- I or latest revision.

iv) Z section MS sheet pile(Az18)shall be conform to relevant IS code.

v) The Steel shall be stored by the Contractor at site such a way as to prevent distortion and corrosion, if not, the Contractor has to replace them at his own cost. Bars of different sizes shall be stored separately to facilitate PMC/Engineer-in- Charge easy access of counting and checking.

vi) For checking nominal mass, Tensile Strength, Bend test, Re-bend test etc. as per IS Code, Specimen of sufficient size shall be cut from each size of the section at random and frequency not less than that as specified below: -

Size of Bar	**For Consignment Below 100 Tonnes**	**For Consignment Above 100 Tonnes**
Under 10mm Dia.	One sample for each **25** tonnes or part thereof.	One sample for each **40** tonnes or part thereof.
10mm to 16mm Dia.	One sample for each **35** tonnes or part thereof.	One sample for each **45** tonnes or part thereof.
Above 16mm Dia.	One sample for each **45** tonnes or part thereof.	One sample for each **50** tonnes or part thereof.

vii) The contractor shall supply free of charge the steel specimen required for testing. The cost of tests shall also to be borne by the Contractor only. Testing of steel shall be done in any Govt. Authorised Laboratories or Reputed Technical Govt. Institute.

viii) The actual issue and consumption of steel (both reinforcement , structural & sheet pile) on work shall regulated and proper accounts shall have to be maintained by the contractor.

ix) Steel brought to site and remaining un-used shall be removed from site duly after obtaining written .permission of the Engineer-in-Charge.

7.4.3 **Cement and Steel:**

			i) The supply of cement and steel by the Contractor shall include cost of materials, all taxes, all Duties levied by State/ Central Govt. from time to time, transportation, storage etc., all complete. ii) Any damage, loss, thefts etc., of cement & Steel shall be to the account of Contractor and the Contractor shall arrange necessary watch/security etc for safe guard at their own cost.

8.	**Technical Specification**		
		8.1	**Part I: Special Application**
		8.1.1	**Drawing List:**
			(a)Three drawings are attached with the Tender documents: (i) Layout of NSD (ii) Sketch of new berth no.7,NSD and adjacent stack yards (iii) Layout of old 7,NSD berth with position of existing Franky piles. (b) The design & drawings prepared during **<u>Engineering</u>** of the project and subsequently approved by the Engineer - In- Charge shall also form part of the contract for the purpose of execution of the project and shall be signed by the PMC, Engineer-in-Charge and the Contractor for Identification. Supplementary drawings, which are required for construction work during execution of the project to be submitted by the contractor time to time and subsequently approved by the Engineer-in- Charge after verification by PMC will also form part of the contract.
		8.1.2	**Preamble:**
			The Technical Specifications contained herein shall be read in conjunction with the other Bid Documents.
		8.1.2.1	**General:**
			The Technical Specifications covering the materials and the workmanship aspects as well as method of measurements and payments are included in this section. These Specifications cover the items of Civil and Non-Civil works coming under scope of this document. All works shall be carried out in conformity with the same. These Specifications are not intended to cover the minute details. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the Latest version there of unless otherwise stated.
		8.1.2.2	**Inclusive Documents:**

			The provisions of special conditions of contract, those specified elsewhere in the tender document, as well as execution Drawings and Notes, or other specifications issued in writing by the Engineer-in-Charge shall form part of the Technical Specifications of this project. The attention of the Contractor is drawn to those clauses of codes, which require supporting specification either by the Engineer-in-Charge or by 'Mutual' Agreement between the "Supplier & Purchaser ". In such cases, it is the responsibility of the Tenderer / Contractor to seek clarification on any uncertainty and obtain prior approval of the Engineer-in- Charge before taking up Supply/Construction. In absence of such prior clarification, the Engineer-in-Charge's instruction will be final and binding on the Contractor without involving separately any additional payment.
		8.1.2.3	**Other Contractors :**
			The Contractor shall allow reasonable facilities to other Contractors working in same area during execution of this contract and ensure that no damage to them is caused to any equipment or installations there due to negligence of his own and / or his Sub-contractor' s workmen.

		8.1.2.4	**Contractor's Working Area:**
			The land for establishment of office and store will be provided to the Contractor at free of cost by the client. The land for the Batching Plant, Pre-cast Yard, Rebar Yard and other temporary facilities may be given on rent as per standard rate of trustees and as per prevalent guidelines within a distance of about 5 Km from the site of work**.**
		8.1.2.5	**Testing of Materials:**
			All Materials to be used in the work shall be subject to inspection and test. The Contactor shall carryout sampling of such materials and making of concrete test cubes as and when instructed by the Engineer-in-Charge/PMC as per the appropriate Indian Standards and as directed by the Engineer-in-Charge. The Contractor shall deliver the samples of materials and concrete test cubes to the approved laboratory in manner as directed by the Engineer- in Charge, who will conduct testing of the materials and concrete cubes. The cost of charges for sampling of materials and concrete cubes, and delivering same to the laboratory including all incidentals in connection with the same as directed by Engineer-in-Charge shall be borne by the Contactor and shall be deemed to be included in his rate. The contractor can establish a laboratory at site for field testing and cube testing with latest/valid calibrations by the Competent Authority of all equipments of testing. However 70% of total testing can be done at field laboratory and rest 30 % will have to be done at NTH or any reputed Govt Technical Institute's laboratory.
		8.1.2.6	**Metric Unit:**
			Metric Unit have been used as far as possible, in the Specification and on all Drawings.
		8.1.2.7	**Seismic Zone:**
			The project lies in Seismic Zone-III as defined in IS- 1893
		8.2	**Part II: Material**
		8.2.1	**General:**
		8.2.1.1	**Indian Standards:**
			All materials shall as far as possible be of Indian Origin and confirm to the latest editions of the Indian Standards. Standards issued elsewhere may be used only if approved by the Engineer-in-Charge for these materials only, for which appropriate Indian Standards do not exsist.
		8.2.1.2	**Sampling and Testing:**

			Materials as decided by the Engineer-in-Charge to be used in the permanent works shall be subjected to inspection and test and samples of such materials shall be submitted to the Engineer-in-Charge for approval before these are brought to the Site. Samples provided to the Engineer-in-Charge or his representative for their retention is to be labelled boxes, suitable for storage. Materials or workmanship not conforming to the quality with approved samples will be rejected by the Engineer-in-Charge or his representatives. Samples required for approval and testing must be supplied in sufficient quantity and time to allow for testing and approval due allowance being made for the fact, that if the first sample fails subsequent samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in the completion of works.

			Materials shall be tested before leaving the manufacturer's premises wherever possible. Materials shall also be tested on the site and they may be rejected if found not be suitable or not in accordance with the specification not withstanding the results of tests at the manufacturer's works or elsewhere or of tests certificate or of any approval given earlier by the Engineer-in-Charge.
		8.2.1.3	**Storage of Materials:**
			Materials to be used in the permanent works shall be stored on Stacks, supports, in bins, under-cover etc., as appropriate to prevent deterioration or damages from any cause whatsoever to the entire satisfaction of the Engineer-in- Charge or his representative and as amplified in the succeeding clauses.
		8.2.1.4	**Records and uses of Materials:**
			The Contractor (s) shall maintain a detailed record of the materials received at site or in his stores or storage and working areas in the vicinity of the site and shall make such records available to the Engineer-in-Charge and PMC at any time or at any later date may be reasonably require. Materials shall wherever possible and practicable be used in the order in which they arrived on the site and in the stores or storage and working areas in the vicinity of the site.
		8.2.1.5	**Notice for Inspections of Materials:**
			Where the Engineer-in-Charge or his representative or PMC shall give notice to the Contractor that materials are to be inspected at the site, the Contractor shall arrange for inspections, tests or examination required, give information to the Engineer-in-Charge or his representative when such materials are ready for inspection, tests or examinations, either during manufacture, fabrication etc., or on completion,
		8.2.1.6	**Use of Permanent Materials for temporary Works:**
			Materials for the permanent works shall not be used for temporary works unless otherwise approved in writing by the Engineer-in-Charge. Granting of such permission shall not prejudice the right the Engineer-in-Charge (EIC) to reject materials so used which have become unfit for use in the permanent works.

		8.2.2	**Cement:**
		8.2.2.1	**Ordering Weighment:**
			The Contractor shall submit to the Engineer-in-Charge (EIC) immediately after the beginning of the contract and estimate of total quantity of cement for both permanent and temporary works required for the contract. The Contactor shall make necessary arrangement for testing of Cement for each consignment along with manufacturer test certificate and furnish the same to the Engineer-in-Charge.
		8.2.2.2	**Contractor (s)'s Responsibilities:**
			The Contractor shall be responsible for keeping the cement in sound and acceptable condition. Any cement which deteriorates while in the Contractor 's charge and to be rejected as unsuitable by the Engineer-in-Charge shall be removed from the site and replaced by the Contactor at their own cost.
		8.2.2.3	**Storage and use of Cement:**
			The cement will be stored in such a manner as to permit easy access for proper inspection and in a suitable weather tight well-ventilated building to protect the cement from dampness.
		8.2.2.4	**Rejection of Cement:**
			The Engineer-in-Charge may reject any cement, which has
			deteriorated owing to the inadequate protection or other causes, or in any other cases where cement is not up to his satisfaction. The Contractor shall remove all rejected cement from the site with immediate effect or as directed by Engineer-in-Charge.
		8.2.3	**Concrete Aggregate:**
		8.2.3.1	**Standard:**
			All aggregate shall comply with the requirements of IS:383.
		8.2.3.2	**Quality:**
			Concrete aggregate shall be Hard, Strong, Durable, Clean and free form adherent coatings or other deleterious matters and shall be obtained from a Govt. approved source. Aggregates which are not perfectly clean shall be wash thoroughly in clean fresh water to the satisfaction of the Engineer-in-Charge. Coarse Aggregates shall be obtained from hard Granite stone by crushing.
		8.2.3.3	**Testing:**
			Prior to commencement of work, representative samples of various aggregates from each source of supply shall be submitted to the Engineer-in-Charge for testing and approval. Samples shall be sufficient in quantities to enable the engineer-in-Charge to carry out the full range of tests in accordance with IS:2386 (Part I to VIII).Only aggregates from sources of supply, which pass the requisite tests and are approved by the Engineer-in-Charge, may subsequently be used in the works and all aggregates used in the works shall be at least equal to the approved samples.
		8.2.3.4	**Storage at Site:**

			Aggregate shall be stored at site on cleaned, well-paved and drained areas which are not liable to flooding. The various sizes and types of aggregate shall be separately stacked.
		8.2.3.5	**Rejected Materials:**
			Any aggregate brought to the site, which are not approved by the Engineer-in-Charge, shall be immediately removed from the site or as directed by the Engineer-in-Charge, at the Contractor (s)'s own cost.
		8.2.3.6	**Fine Aggregates:**
			Fine Aggregates shall consist of sand from any Govt. approved source. Fine Aggregate shall be washed in an approved washing plant if ordered to conform to either Grading Zone- I or II or III, as specified in IS:383.
		8.2.4	**Water:**
			Clean fresh water shall be used for mixing all concrete, grout & mortar. It shall be free from injurious and bunt of soil, acid, alkalis, organic matters or other deleterious matter including Saline water.
		8.2.5	**Admixtures for Concrete:**
			Admixtures to the concrete shall not be used without the written permission of the Engineer-in-Charge. When permitted, the contractor shall furnish full details from the manufacturers and shall carry out such tests as the Engineer-in-Charge may require before any Admixture to be used in the work.
		8.2.6	**Steel Reinforcement:**
		8.2.6.1	**Standard:**
			Mild Steel reinforcing bars for concrete shall be round in cross section and shall comply with requirements of Grade- I IS:432. HYSD bars for concrete reinforcement shall comply with the requirements and tests as per IS:1786.
		8.2.6.2	**Ordering:**
			The contractor shall submit to the Engineer-in-Charge
			immediately after the beginning of the Contract, estimate of the total quantity of steel required for both Temporary as well as for Permanent works.
		8.2.6.3	**Tests:**
			The contractor has to arrange for tests on samples of each consignment along with manufacturers tests certificates as per the provisions of Indian Standards and the same shall be submitted to the Engineer-in-Charge. Any Steel fails in test and found unfit to use shall be removed from the site immediately or as directed by the Engineer-in-Charge.
		8.2.6.4	**Contractor 's Responsibilities:**
			Once a consignment is approved by the Engineer-in-Charge, it shall be stored in a clean and acceptable condition until it is required to be used. Any steel rendered unsuitable during storage shall be replaced by the contractor at his own cost.
		8.2.7	**Structural Steel:**
			Structural Steel used in work, other than steel in reinforced bars shall conform to IS:226 - "Structural Steel (Standard Quality)" and IS: 2062- "Structural Steel (Fusion Welding Quality)". Sheet pile should be conform to relevant Indian standard.
		8.2.8	**Bentonite:**

			Sodium based bentonite shall be used in preparation of bentonite-slurry. The bentonite used in the work shall satisfy the following requirements: i) The Liquid Limit of Bentonite shall be more than 300% and less than 450%. ii) Sand content of the Bentonite Powder shall not be greater than 7%. iii) The Swelling Index shall be at least two times its dry volume. iv) The PH value of the Bentonite suspension shall be less than 11.50. v) Bentonite solution shall be made by mixing it with fresh water, using pump for circulation. The density of the bentonite solution should be about 1.12. vi) The Marsh-Viscosity when tested by Marsh Cone shall be about 30 seconds.
		8.2.9	**Jointing Materials:**
		8.2.9.1	**Joint Filler:**
			Preformed Joint-filler shall be of approved manufacturer as decided by the Engineer-In-Charge.
		8.2.9.2	**Sealing Compound:**
			Where joint sealing compound is specified, it shall be of an approved brand. It shall have good adhesive properties free from any corrosive effect and shall not slump in vertical or inclined joint nor shall it bleed into or corrode the materials with which it is in permanent contact and shall have to be used after approval of the same by the Engineer-In-Charge.
		8.3	**Workmanship:**
		8.3.1	**General:**
		8.3.1.1	**Standard:**
			A high standard of workmanship in all item of works will be required. The Contractor shall ensure that only skilled and experienced trade-men are employed during execution of wotrk.
		8.3.1.2	**Plant:**
			The Contractor shall be responsible for the supply, use and maintenance of all construction plants and equipments and they shall ensure that all those P& E are suitable for the work and are maintained in such manner as to ensure their efficient working and duly calibrated as per standard by an Authorised Approved Agency. The Engineer-in-Charge may direct that any plant which is not efficient and prejudicial to the quality
			of the work to be removed from the site and replaced by a new plant to his satisfaction.
		8.3.1.3	**Supervision:**
			The Contractor's supervisory staff shall be qualified and experienced in the type of work being carried out through their supervision and capable of ensuring execution of quality work.
		8.3.1.4	**Temporary Works:**
			Where required, the Contractor shall furnish such details of his temporary works as may be called for by the Engineer-in- Charge and the Contractor shall satisfy the Engineer-in- Charge as to their safety and efficiency. The Engineer-in- Charge may direct any temporary works which he considers unsafe or in-efficient and that shall be removed and replaced immediately by the contractor.
		8.3.2	**Excavation and Backfilling:**
		8.3.2.1	**General:**

			The whole of the excavation for the foundation works shall be carried out to the Widths, Lengths and Depths and within the Lines and Levels, indicated in the Drawings or as directed by the Engineer-in-Charge/ PMC. Any excavation beyond such limits or instructions shall have to be make good by the contractor at his own expense to the satisfaction of the Engineer-in-Charge/ PMC.
		8.3.2.2.	**Method of Excavation:**
			The Contractor may carry out these excavations by any method, he considers most suitable, subject to any stipulations contained in the contract and in the specifications but take the permission from Engineer –in –Charge to adopt that method for execution.
		8.3.2.3	**Shoring:**
			The Contractor (s) shall provide all shoring, timbering or other approved supports at sites of the excavations as may be necessary to prevent ground movement at his own cost. The contractor shall bear all responsibilities connected with such shoring, including de-watering after approval of the Engineer-in-Charge at his own cost.
		8.3.2.4	**Bottom of Excavation:**
			The bottom of all excavations shall be trimmed and levelled in accordance with the Drawings.
		8.3.2.5	**Disposal of Excess Excavations:**
			The excavated/dismantled materials not required for filling is to be transported on roads disposed of from the site as directed by the Engineer-in-Charge. The site must at all times be kept free from surplus materials.
		8.3.2.6	**Backfill:**
			All return fill to the excavated trenches, pits and filling behind the berth shall consist of material selected from excavationsor elsewhere as approved by the Engineer-in-Charge.
		8.3.3	**Piles:**
		8.3.3.1	**Method of Construction:**
			The Contractor (s) must furnish to the engineer-in-Charge/PMC, before commencing work, a detailed method of construction intending to adopt for Pilling work together with the programme of construction for his approval and then start the work.
		8.3.3.2	**Drilling Fluid:**
			Bentonite shall be mixed thoroughly with clean fresh water to make a suspension, which will maintain the stability of the pile excavation for the period, necessary to place concrete and complete construction. The fluid used shall be such as to form a suspension, which remains stable under the saline conditions, likely to be encountered at the site.

			Control tests shall be carried out on the bentonite suspension using suitable apparatus. The frequency of testing the drilling fluid and the method and procedure of sampling shall be as directed by the Engineer-in-Charge/ PMC. The density of freshly mixed bentonite suspension shall be measured daily as a check on the quality of the suspension being formed. The measuring device shall be calibrated to read to within 0.005 g/ml. Tests to determine Density, Viscosity, Shear Strength and PH-Value shall be applied to bentonite supplied to the pile boring.
		8.3.3.3	**General Condition:**
			Installation of Bored Cast-in-Situ Piles of specified Diameter to the lines and levels, specified herein after and the Drawings, including Pile-liners, boring, in all types of soils, chiselling in rock, concrete etc.
		8.3.3.4	**Concrete Quality:**
			Cement to be used in pile foundation shall be Portland Slag Cement (PPC) or Ordinary Portland Cement (OPC) confirming to relevant IS Code (latest version) or as directed by the Engineer-in-Charge. The Grade of concrete for all piles shall be M 40, the cement content of piling work shall be minimum 450 kg/Cum and the maximum water-cement ratio shall be 0.40. For obtaining workability of concrete may have to use super-plasticizer as per approval of Engineer-in- Charge, slump shall be between 150mm to 175mm, Maximum size of aggregate shall be 20mm.
		8.3.3.5	**Founding Levels of Piles:**
			Boring equipment and accessories shall generally conform IS:2911 (Part-I/ Sec.2). Boring may be done by shell and auger, rotary or percussion equipment or grabbing equipment using reversed or direct mud circulation method. The boring tools shall be such that section affects are minimised during boring and extraction of mud. The boring below the bottom of lime of piles shall be carried out by using bentonite slurry which shall be of approved quality. The size of boring tools shall not be less than the diameter of the pile by more than 75mm. The soil obtained during boring including mud shall be disposed as in SPM, Kolkata identified location at a distance of above 10 km .The decision of Engineer-in-Charge shall be final and binding in this regard.
		8.3.3.6	**Drilling Mud:**
			The level of drilling mud shall always be maintained above the level of high water. Care shall be taken that due boring and removal of the soil, the hole shall remain almost full with the fluid which should preferably be kept in motion the density and composition of the bentonite fluid shall be such as will suit the ground conditions and maintained fine materials from the boring in suspension are shall conform to IS:2911 (Part I/ Sec.2).
		8.3.3.7	**Mild Steel Liner:**
			Permanent Mild Steel Liners shall be provided as shown in the drawings. Mild steel liner shall be provided for all piles from cut-off level upto the required levels as directed by the Engineer-in-Charge (EIC).

		8.3.3.8	**Cleaning of Borehole Bottom:**
			The bottom of the hole shall be cleaned carefully before concreting work is taken up. The cleaning of the hole shall be ensured either by the sling with fresh drilling mud injected at the bottom of the hole or by Air lifting process. To lift the soil from founding level before concreting the bottom of the
			bore hole shall be agitated by jetting with drilling mud at higher pressure than that used during boring or by Air pressure, the specific gravity of the mud suspension near the bottom of bore hole shall be regularly monitored. Suitable slurry-sampler shall be used for this purpose. Consistency of the drilling mud suspension shall be maintained throughout the boring as well as during concreting operation in order to keep the hole stabilised as well as to avoid concrete mixing up with the thicker suspension of the mud. Concreting shall not be taken up if the density of bottom slurry is more than 1.2.
		8.3.3.9	**Concreting:**
			Concreting of pile shaft shall start as soon as possible after the procedure for cleaning the borehole bottom specified herein above have been concreted and approval of Engineer-in-Charge obtained. Concrete shall be placed by means of a tremie pipe, should a borehole be left un- concreted for more than two hours, it shall be cleaned thoroughly as directed by the Engineer-in-Charge before placing concrete. A vermiculite plug should be introduced in the tremie before pouring concrete. For first pour a plug shall be introduced at the junction of funnel. This plug is then moved and funnel lifted by about 15cm. To allow the concrete to fall and flush out the bottom. During concreting, the concreting levels in the pile shaft shall be checked every 2m intervals in order to note the difference, if any between the theoretical quantity that should have been placed and actual quantity that has gone in. This is to locate the position of overcut during boring and/ or under filling of concrete.

		8.3.3.10	**Tremie Concrete:**
			The following procedures shall be used in tremie concrete in piles. i) The concreting of a pile shall be concreted in one continuous operation. ii) The hoper and tremie shall be closed system embedded in the placed concrete, through which water cannot pass. iii) The hoper shall be large enough to hold a complete batch of concreting minor content of the concrete bucket if any. The diameter of the tremie pipe shall not be less than 200mm. iv) The first charge of concrete shall be placed with a sliding plug pushed down the tube a head of it or with a steel plate in adequate charge to prevent mixing of concrete and water. However, the plug shall not be lift in the concrete as a lump. v) The tremie pipe shall always penetrate well into the concrete with adequate margin of safety against withdrawal of the pipe. vi) All tremie pipes should be scrupulously cleaned after use. Normally concreting of the piles shall be uninterrupted till completion of pile in the exceptional case of interruption on concreting which shall not be more than one hour under any circumstances. The tremie shall not be taken out of the concrete instead it shall be raised and lowered slowly from time to time to prevent the concrete around the tremie from setting. Concreting should be resumed by introducing a little richer concrete with a higher slump for easy displacement of the partly set concrete.

			If the concreting can not be resumed before final setting up of the concrete already placed, the pile so cast may be rejected or accepted with modifications at the sole direction of the Engineer-in-Charge. In case of withdrawal of tremie out of the concrete either accidentally or to remove a Chol in the tremie may be reintroduced in the following manner to prevent the pregnation of laitance or scum laying on the top of the concrete already deposited in the bore. The tremie shall be gently lowered on the old concrete with very little penetration initially. A vermiculite plug shall be introduced in the tremie which will push the plug forward and will emerge out of the tremie displacing laitance scum. The tremie will be pushed further in steps making fresh concrete weep away laitance/ scum in its war when tremie is buried by about 60 to100cm concreting may be resumed.
		8.3.3.11	**Cut off Level:**
			The top of concrete in a pile shall be brought above the cut off level to permit removal of all laitance and weak concrete before capping and to ensure good concrete at the cut off level for proper embedment into the deck slab. When concrete is placed by tremie method, concrete shall be cast upto the piling platform level to permit overflow of concrete for visual inspection or to a minimum upto 1m above the cut off level. In the circumstances where cut off level is below ground water level the need to maintain a pressure on the onset concrete equal to or greater than water pressure shall be observed and accordingly length of extra concrete above cut off level shall be provided.
		8.3.3.12	**Defective Pile:**
			In case piles cast are found defective and unacceptable by Engineer-in-Charge , these shall be removed or left in place in case these piles do not affect the performance of the adjacent piles or to permanent works. In such cases additional piles in replacement of defective piles shall be constructed by the contractor at his own cost as directed by Engineer-In-Charge. Any design changes as a result of installation of new piles will be carried out by the contractor at his own cost. Any deviation from the designed location alignment or lead capacity of any pile shall be noted and adequate corrrective measures shall be taken by the contractor at his own cost well before the concreting the pile capping if the deviations are beyond the permissible limit.

		8.3.3.13	**Tolerances:**
			Piles shall be installed as accurately as possible as per the designs and drawings. For the piles a deviation of 0.5% from the vertical line shall not be exceeded however the pile shall not deviate more than 75mm or 1/10th of diameter whichever is more from their designed position at the cut off level. In case of single pile in a pile cap portional tolerance shall not be more than 50mm. In case of piles deviating beyond these limits and to such an extent that the resulting eccentricity can not be taken care of by a redesign of the pile cap or pile ties. The piles shall be replaced by one or more additional piles by the contractor at his own cost along with any additional cost for pile cap being over size. The decision of Engineer-In-Charge shall be final and binding on the contractor. Further the redesign of the pile sub-structure and super-structure associated with the supplemental or additional pile shall be carried out by the contractor at his own cost.
		8.3.3.14	**Chipping of Pile Top:**
			Manual chipping shall be permitted after 3 days of pilecasting , pneumatic chipping shall not be started before 7 days.
		8.3.3.15	**Pile Load Tests:**
			i) The contractor shall conduct 2 nos. of initial pile load tests on test piles on 1200 mm dia. The contractor shall conduct dynamic pile load tests as mentioned below. a) 1200 mm dia. piles- 4 nos. ii) The contractor shall conduct pile integrity tests for 50% of total nos of piles.
		8.3.3.16	**Adjacent Structures:**
			When working near existing structures care shall be taken to avoid any damage to such structures. In case of deep excavations adjacent to piles, proper shoring or other suitable arrangements shall be done to guard against the lateral movement of soil structures or releasing the confirming soil stress.
		8.3.3.17	**Reinforcement:**
			Main longitudinal reinforcement in the length of the piles as well as links or spirals shall be provided as shown in the drawing. Reinforcing cage shall be handed and installed carefully with suitable PCC cover blocks of grade M 40 at the cost of contractor without damaging its shape of construction of each pile or as directed by Engineer-In-Charge.
		8.3.3.18	**Recording of Data:**

			During construction of piles the following data shall be recorded along with any other data as directed by Engineer-In-Charge in triplicate on completion of construction of each pile: i) Data of starting and completion of each pile. ii) Sequence of installation of piles. iii) Dimensions of piles, reinforcement details and marking of each pile. iv) Details of mild steel liner provided along with stiffener. v) Depth bored and founding level along with a borelog indicating nature of sub-soil structure. vi) Time taken for penetration of every 15cm duringlast 1m depth before founding level. vii) Method of cleaning bottom of hole at founding level before concreting. viii) Time taken for concreting. ix) Cut off level / working level / RL of top ofconcrete. x) Actual cement consumption including theoretical consumption, slump of concrete. xi) Any other relevant important observation.
		8.3.4	**Concrete:**
		8.3.4.1	**Qualified Personnel:**
			A fully qualified and experienced concrete quality control Engineer Shall be employed by the contractor and shall be available on site at all times when concreting is taking place. Prior to commencement of the works, contractor shall submit for the approval of EIC, details of qualification and experience of the Engineer to be employed on the work of concrete quality control. Operators for mechanical vibrators, mixers and foreman in-charge of placing of concrete shall be fully trained and experienced for their class of work and they shall be named to the Engineer-In-Charge for approval.
		8.3.4.2	**Designed Proportion:**

			The Contractor shall make calculations and carry out all the necessary tests to determine each class of concrete the proportion by weight of cement, Aggregate and water necessary to produce concrete in accordance with the latest relevant IS Code prior to commencement of the works. The contractor shall submit Mixed Design report to the Engineer-In-Charge/PMC for approval of the same from Engineer-In-Charge . i) The proportion of cement, coarse aggregate, fine aggregate and water so determine. ii) The sieve analysis is of aggregate, which EIC proposes to use in the works. iii) Full details of preliminary tests on each class of concrete and on the ingredients of each class of concrete. iv) All calculations relevant to the design of each class of concrete mix. v) The density of concrete shall not be less than 2.4 tonnes per cum. The proportions adopted shall be subject to the approval of the EIC & they must be determined for each different type of aggregate the contractor proposes to use and whenever contractor proposes to change to a different type of aggregates during the course of work. The contractor shall submit Mix Design calculations and carry out all necessary tests to determine for each class of concrete the proportion by weight of cement, Aggregate and water including admixtures (if any) necessary to produce concrete in accordance with relevant standards prior to commencement of the work for approval of EIC/PMC. The concrete to be incorporated in the various items of works shall be of required strength of high durability. The cement used therefore, shall be Ordinary Portland Cement or Portland Slag Cement conforming to IS Code of latest edition. The Min. Quantity cement to be used in each case if stipulated in the respective item specifications are to be maintained during concreting..

			Design Mixed Concrete:

			Approved super-plasticizers in required as per manufacturer's specification shall be used to get the desired workability and strength. The super-plasticizer to be incorporated in the work shall conform to relevant IS Code and shall be of sulphonate naphthalene formaldehyde condensate and shall be compatible with the Portland Slag Cement to be used in the work and shall produce workable concrete without loss of Slump until placed in position thus helping in placing and compaction of the concrete. The super-plasticizer to be used shall be got approved by any Govt. approved laboratory, before incorporation in the work and a test certificate to that effect shall be submitted by the Contractor. The proportion of superplasticizer to be used in concrete shall be determined by the tests as directed by the Engineer-In-Charge. The concrete mix shall be designed for values of target mean strength not lower than those indicated in IS specifications. It is the responsibility of the Contractor to try various mix-proportions to get the required strength and workability specified.

			i) Maximum cement content in the mixes shall be subject to the approval of Engineer-In-Charge based on the tests results indicated above. Extra cement if consumed than what is stated above will be to the account of the Contractor. The Contractor is deemed to have ascertained himself of the quantity of extra cement required to achieve the required strength. ii) Even if the required crushing strengths are achieved with lesser quantity of cement, the Minimum quantity specified above shall be used. iii) All coarse aggregates for the concrete works shall be obtained from hard Granite stone.
		8.3.4.3	**Declared Proportions:**
			When the proportions are submitted to the Engineer-In-Charge, which he considered will produce concrete having the properties requires f, such proportions shall be known as the declared proportions. However, no agreements by the Engineer-In-Charge to such declared proportions, shall relieve the contractor any of his responsibility to use in the works at all times.
		8.3.4.4	**No Deviation from Declared Proportions:**
			No deviation from declared proportions will be allowed unless and until the EIC shall file his written Authorisation for the adoption of revised proportions for any class of concrete: This provision shall also apply to any revised proportions so Authorised.
		8.3.4.5	**Inspection and Testing:**
			As the work progresses inspection of cement, aggregate, reinforcing steel and testing of concrete strength will be done by the Engineer-In-Charge/PMC. The Contractor's concrete plant and material stores shall be made accessible to the Engineer-In-Charge/PMC at all times for inspections and taking samples. The contractor shall facilitate in all possible ways the inspection and testing of sampling by the EIC/PMC.
		8.3.4.6	**Test Cubes:**
			Test cubes shall be made in accordance with IS:516, except that all test cubes unless otherwise ordered by the Engineer-In-Charge shall be compacted by vibration. The contractor shall provide suitable-portable vibration table for compaction of concrete in cubes. Test cubes shall be cured and stored as provided in IS:516, "Methods of tests for strength of concrete". Test tubes used for checking early strength of pre-cast units shall be stored under the same conditions and in contract with the units to which they relate.
		8.3.4.7	**Works Tests:**
			Not less than six test cubes shall be taken at each section of the work and / or each day's work on each class of concrete. For the purposes of these specifications "Section" of the work shall be as defined by the Engineer-In-Charge.
		8.3.4.8	**Concrete Testing:**
			All sampling and testing of concrete shall be carried out in accordance with IS:1199, "Method of Sampling and Analysis of Concrete" unless otherwise specifically provided in the specification.
		8.3.4.9	**Testing:**
			Three out of each batch of six test cubes will be tested by the Engineer-In-Charge for crushing strength and weight at 7 Days and the remaining at 28 days or at such other time as the Engineer may determine.

		8.3.4.10	**Cost:**
			The cost and charges for sampling and making concrete cubes and delivering the same to other places for testing including all incidentals in connection with the same as directed by the Engineer-In-Charge shall be borne by the Contractor.
		8.3.4.11	**Measurement of Ingredients:**
			The Proportioning of ingredients of concrete shall be performed by an approved weigh-batching machine periodically as determined by the Engineer-In-Charge. Water shall be fed into the mixer from a tank provided with means for adjusting the flow of water suitably measured so as to supply the quantity determined for each class of concrete. Due allowance shall be made for the weight of water carried out by the aggregates, the actual amount added at the mixture being reduced as necessary. For this purpose, the moisture content of coarse and fine aggregates shall be ascertained periodically and at any other times when alterations of the moisture content may be expected due to new deliveries of aggregates, damp weather or any other reason.
		8.3.4.12	**Mixing:**
			Concrete shall be thoroughly mixed to uniform consistency in approved type pan or drum mixer. The use of continuous mixer will not be allowed. If the contractor should find it expedient to use small type mixer for special or outlying portions of the work rather than to supply from the main batching plant or plants, he may do it subject to the approval of the Engineer-In-Charge, use smaller approved concrete producing units of the weigh-batch type. In such cases the mix shall be adjusted to whole bags of cement and no splitting of bags will be allowed. The times allowed for the mixing shall as per standard and as directed by EIC.
		8.3.4.13	**Discharge from Mixer:**
			The concrete shall be discharged from the mixer on to a level clean, water type platform or floor or into water type containers. The area surrounding the mixer shall be paved and kept clean.
		8.3.4.14	**Transportation of Concrete:**
			The concrete shall be transported from the mixer at work place as rapidly as possible and in such a manner that there shall be no separation or loss of its ingredients. In no circumstances shall more than half an hour elapse between the time water is added to the mix and the time when the concrete is placed and compacted in position. No concrete shall be permitted to be used after initial setting taken place. The use of concrete distributing chutes at an angle of more than 45 degrees from the horizontal will not be permitted without the sanction of Engineer-In-Charge. Use of Retarding agents can be permitted with prior approval of EIC at the contractor's cost.
		8.3.4.15	**Authorization to Pour:**
			Authorization to pour concrete shall be obtained by the contractor from the Engineer-In-Charge at least 1 day in advance for each pouring.

			Where the full height of concrete is not being poured in one continuous operation the surface of each lift shall be finished horizontal and any laitance removed between the period of initial and final set.
		8.3.4.17	
		8.3.4.16	**Depositing of Concrete:**
			The arrangements of depositing concrete shall be subjected to the approval of EIC. In no case shall the concrete be dropped or thrown from a height of more than 2 metres. Concreting of beams, slabs and similar members shall be carried out in one continuous operation to the full depth of the member and the sequence of placing shall be so arranged as to avoid disturbance of partially set concrete. Freshly laid concrete shall not be wheeled over or otherwise disrupted. When depositing concrete adjacent to a construction joint, special care shall be taken not to disturb the dowels or other reinforcing bars projecting from the existing concrete.
			Compaction of Concrete:
			The contractor shall agitate the placed concrete thoroughly into places by means of sufficient numbers of approved mechanical vibrators of adequate power and having a frequency not less than 6000 impulses per minutes. The vibrator shall allow to sink freely of its own weight until it enters the previous lift. It shall be withdrawn immediately at the same rate and to be used at a new location. Concrete once vibrated shall not be vibrated again, except prior approval of EIC. The contractor shall ensure that the concrete shall thoroughly worked around the reinforcement and against external shutters so that all entrained air got expelled and the concrete surface when exposed is found good and free from air pockets, honey combing or any other defects.
		8.3.4.18	**Concreting in Inclement Weather:**

			In the event of Rain, Storm or any other severe conditions arising, concreting shall be stopped . Appropriate temporary stop ends, Vee-grooves etc., placed as may be necessary. During wet weather conditions the concrete shall be adequately protected as soon as placed. The contractor shall always be ready with the approved framed sheeting and tarpaulins etc. for the protection of newly placed concrete, each time while concreting. If any damage/ dispute occurs in the concrete due to negligence of the contractor, for the same reasons, the damaged/ disputed concrete has to be replaced by taking corrective measures as directed by the Engineer-In-Charge at contractor's cost.
		8.3.4.19	**Underwater Concreting:**
			For underwater concreting all protective measures shall be taken by the contractor to avoid cement from washing out. The concrete may be placed under water through a tremie pipe, provided with suitable hopper. Extra cautions shall be taken by the contractor to avoid segregation and bleeding. The method of placing concrete shall be applied only after having prior approval of Engineer-In-Charge, on the same.
		8.3.4.20	**Construction Joints:**
			Construction joints shall be given at the position as directed by the Engineer-In-Charge/PMC. The contractor shall wherever practicable, strip shutters as soon as possible after pouring, subject to the approval of the EIC. Any skin or laitance should be removed and the tops of the stones exposed by means of brushing and washing. At horizontal construction joints, removal of laitance and exposure of the tops of stone shall be accomplished wherever practicable, by means of washing and brushing shortly after pouring, care being taken to obviate undue erosion of the mortar. After cleaning, excess water shall be removed immediately to limit absorption by the cement. In case where the concrete has set out but not set hard the removal of laitance and roughening shall be accomplished by wire brushing and washing, great care being taken not to damage the underlying mass. Where, at either vertical or horizontal joints, the concrete has set hard any skin or laitance shall be removed after the surface roughened by hammering with an approved power operated 'bush' hammer followed by wire brushing to

			remove all loose particles. When using this procedure, great care shall be taken to avoid breaking of the arise of the joint face and stunning whichever treatments has been given to the exposed surface. Facing matter shall be cleaned off from that surface and further wire brushing if necessary before depositing freak concrete. It shall then be thoroughly washed with clean fresh water and the surplus blown off. The surface while still moist shall be covered evenly with a layer not less than 4mm. thick of 1:1 cement mortar of medium consistency, which must be vigorously stripped into the surface by means of a suitable stiff brush, the depositing of the fresh concrete following on closely. It is of the utmost importance that the fresh concrete shall be forced hard on to the mortar layer and the cast faces. To this end the compacting tools and vibrators, where appropriate measures shall be worked right up to the old faces and into angles and corners formed between them and the shutters and the damping effect on vibration in such positions shall be allowed for.
		8.3.4.21	**Curing:**
			All concrete shall be protected during hardening from the harmful effects of sunshine, moisture and drying winds. All exposed faces of concrete shall be kept continuously moist for a period of 14 days. Slabs or other pours of large surface area shall be covered with damp hessian immediately after pouring. For 14 days thereafter concrete shall be kept continuously damp by spraying the cover with clean fresh water or by covering it with suitable thickness of sand layer and kept continuously damp or by ponding where practicable.
		8.3.4.22	**Screeding:**
			All the surfaces of slabs or other members not required to be shuttered are to be screeded in an approved manner and within a tolerance of plus or minus 5mm. of true level and grade. In making such finish care shall be exercised not to work in excess fines to the top. Care is to be taken to ensure that the concrete is properly closed and for this purpose vibrator screed board or plates will normally be required.
		8.3.4.23	**Concrete below Specified Crushing Strength:**
			Should the test cubes fail to meet the minimum specified crushing strength for each class of concrete, the Engineer-In-Charge may take one of the following decisions. i) Instruct the contractor to carry out such additional tests and / or works to ensure the soundness of the structure at the contractor expense. ii) The Engineer-In-Charge may accept the work with justified reasonableness. Any decision to accept the work shall be entirely at the discretion of the EIC, who will make a reduction in the rate of the appropriate item. iii) Reject the work and instruct the section of works to which the failed cubes relate to dismantle and replaced at the contractor ‘s expense.
		8.3.4.24	**Faulty Work:**
			Concrete defective from any cause whatsoever, shall, if so directed by the EIC be cut out and the work reconstructed by the contractor ‘s cost, concrete thus cut out shall not be used again. No reconstruction of repair to default work shall be done without the permission of the Engineer-In-Charge and in such a manner as he shall direct or approve.

		8.3.5	**Shuttering:**
		8.3.5.1	**General:**
			All shuttering and supports included under the contract shall be designed by the contractor and relevant drawings together with calculation for strength and deflection shall be submitted to the Engineer-In-Charge/PMC for approval before commencement of work.
		8.3.5.2	**Fixing:**
			The contractor shall fix all the form work in perfect alignment. The form work shall be securely based so as to able to withstand, without appreciable displacement, deflection of movement of persons, materials and plant. All the joints should be watertight to prevent leakage of cement slurry from the concrete. Wedges and clamps are to be used wherever practicable. Form work after erection to be checked by the EIC/PMC before placement of concrete.
		8.3.5.3	**Removing:**
			Forms and shutters shall not be disturbed until the concrete has sufficiently hardened. The proper time of removal should be determined by the Engineer-In-Charge/PMC.
		8.3.5.4	**Wrought Shuttering:**
			Wrought shuttering shall be such as to produce a first-class fair face on the free from board marks or any other disfigurements and shall be used for exposed surface where specified or directed by Engineer-In-Charge/PMC. Wrought shuttering is to be aligned within a tolerance of 3mm.
		8.3.5.5	**Special Provision:**
			Wherever concreting of the narrow members is required to be carried out within shutters of considerable depth, temporary openings in the sides of the shutters shall, if so directed by the Engineer-In-Charge be provided to facilitate the pouring and consolidation of the concrete. Temporary openings shall be provided as necessary at the bottoms of shutters of columns, walls and deep beams to permit the expulsion of rubbish etc..
		8.3.5.6	**Preparation of Concreting:**
			Before any concreting is commenced, shutters and centering shall be carefully examined and the space to be occupied by the pour thoroughly, cleaned out. The inside of shutters shall be treated with coating of an approved substance to obviate adhesion and, where necessary to prevent absorption from the concrete, the shutters shall be thoroughly wetted shortly before concreting is commenced.
		8.3.5.7	**Contractor 's Responsibility:**
			Any damage resulting from premature removal of shutters of from any other course shall be made good by the contractor at his own expense.
		8.3.6	**Reinforced Concrete:**
		8.3.6.1	**General:**
			The following clause shall be read in conjunction with the section relating to concrete.
		8.3.6.2	**Storage:**
			The reinforcing bars shall be stored on the site on timber or concrete supports suitably spaced and sufficient height tokeep the steel clear of the ground.
		8.3.6.3	**Bar Bending Schedule:**

			Bar bending schedules will be prepared by the contractor and shall be submitted to the Engineer-In-Charge/PMC in triplicate, for approval at least two weeks before bars are to be bent. The EIC/PMC will check and return one copy for the contractor 's use, with amendments noted, if any. The cost of preparing schedules will be deemed to be included in the rates for reinforcement in the bill of quantities. Any approval given by the EIC shall in no case, relieve the contractor from being responsible for
			the accuracy and correctness of the bar bending schedule.
		8.3.6.4	**Reinforcement Cages:**
			The reinforcement as specified in the approved drawing shall be pre-fabricated to suitable length of cages and to full cross-sectional areas, as directed by Engineer-In-Charge/PMC. The cages shall be provided with necessary stiffness rings, cross bracings, chairs, etc., to provide rigidity to the cage to the satisfaction of the EIC. Necessary cement concrete roller cover blocks shall be provided to the cage to ensure proper cover to the reinforcement as directed by the EIC/PMC. While lowering the cages in position proper care is to be taken to ensure that the bars in the lower cage are lapped to the corresponding bars in the upper cages and properly welded. The disturbed stirrups if any at the lap portion are to be rectified as directed by the EIC/PMC.
		8.3.6.5	**Bending Reinforcement:**
			Bends, Cranks etc. of reinforcement shall be carefully formed in exact accordance with the Drawings or Bar- Bending Schedules otherwise all bars shall be truly straight. Bends shall be made cold round former having a diameter of Four times the Diameter of the Bars. Stirrups and Binders shall be bent to the radius of the bars against which they are to be in contact. Bending of bars shall be in accordance with IS: 2502 "Code of practice for bending and fixing of bars for concrete reinforcement". Heating of the bars will not be allowed. Bars, incorrectly bent shall be used only if means of or straightening and re-bending having been approved by the Engineer-In-Charge. No reinforcement bars shall be bent when in position without approval of EIC, whether or not it is partly embedded in the hardened concrete.
		8.3.6.6	**Binding Wire:**
			All bars shall be bound tightly together where they cross with annealed steel wire of not less than 1.22 mm. dia. (18 gauge). The free ends of the binding wires shall be bent inwards.
		8.3.6.7	**Placing and Fixing:**

			The number, size and form of all reinforcement shall be in exact position accordance with the drawings. The reinforcement shall be placed, fixed and maintained in the forms within the tolerance of 5 mm. during the placing and compaction of the concrete. Horizontal bars shall be supported or suspended with concrete blocks to prevent them from sagging. Such spacer / cover blocks should be precast from concrete of the same grade as the concrete in which they are to be embedded. Each block shall be cured for 10 Days or more. Wires or Spring Clips, embedded on the centre of the blocks so that it shall not be in contact with shuttering and subsequently cause rust marks on the concrete. Where necessary, Spacer bars, supporting tools and distance pieces shall be supplied and fixed by the contractor to maintain the reinforcement rigidly in the correct position and to the satisfaction of Engineer-In-Charge. Any Ties or Stirrups connecting the bars shall be tight so that bars are properly braced, inside of their curved parts in actual contact with the bars, around which they are intended to be fixed. The cost of binding wires as well as cover blocks shall be deemed to be covered in the reinforcement steel.
		8.3.6.8	**Splicing Reinforcement:**
			Where Splicing and / or overlapping in reinforcement are required, the bars shall be provided with such splices and/ or overlaps as shown in Drawings or as directed by Engineer-In-Charge.
		8.3.6.9	**Butt Welding of Reinforcement:**
			Butt welding of reinforcing bars shall only be used where specified or shown in the Drawings unless permission in writing has previously been given by the Engineer-In-Charge. Where Butt welding is carried out, the ends of the bars shall be prepared with single **45 Degree V** and Backing plates shall be used. The minimum root face will be **One Quarter** of the Bar dia.
		8.3.6.10	**Cover to Reinforcement:**
			The Cover to the reinforcement shall be as per relevant IS Code (latest version).
		8.3.6.11	**Reinforcement to be Cleaned:**
			All steel reinforcement before the concrete is deposited shall be clean, free from dust, loose scales, oils, rust, grease or any other deleterious materials. Particular care shall be taken to avoid contamination of reinforcement with mould oil.
		8.3.6.12	**Depositing Concrete:**
			No concrete shall be deposited until all concrete and reinforcement have been inspected and approved by the Engineer-In-Charge/PMC. There shall be in attendance on each concreting Gang Minimum one competent Steel Fixer, who shall ensure that the reinforcement and other embedded fittings are kept in position on during placing and compaction of concrete.
		8.3.7	**Pre-cast Concrete:**
		8.3.7.1	**Pre-casting Yard:**

			The precast units shall be cast on or their shutters supported from a suitably prepared level Un-Yielding paved areas. No payment will be made for preparation of casting Yards. The contractor may provide some alternative bottom shuttering with planks etc., instead of concrete platform as directed by Engineer-In-Charge, at **no extra** cost.
		8.3.7.2	**Lifting and Stacking:**
			Lifting and Stacking of pre-cast units shall be undertaken without causing shock, vibration or un-due stress to off in the units. The pre-cast units shall not be lifted, transported or used in the works until they are sufficiently matured. The crushing test cubes which are to be kept with the pre-cast units will be used to assess the maturity of the Units. The contractor shall satisfy the Engineer-In-Charge of that methods, he proposes for the lifting, transporting and setting pre-cast units, which will not over-stressed or damage the units in anyway. In the event of overstress or damage due to whatever cause, the unit/ units concerned will be liable for rejection and if so rejected shall be immediately broken up and removed from the site or as directed by EIC. The contractor shall replace such rejected units at his own cost.
		8.3.7.3	**Marking:**
			The contractor shall ensure that all pre-cast units are properly marked-in clean and legible manner with the reference no and the date of casting which information shall be clearly visible where the units are stacked.
		8.3.7.4	**Pre-casting Records:**
			Full and accurate records are to be maintained of all pre-cast works. Every unit shall have a reference no. Date of casting, Date of removal from bed and position of placing shall be recorded together with Test Cube Results.
		8.3.8	**Structural Steel Works:**
		8.3.8.1	**Fabrication:**
			All Fabrication shall be in accordance with IS:800 "Code of Practice for use of Structural Steel in General Building Construction" and IS:1915 "Codes of Practice for Steel Bridges". Extensive use of Templates shall be made. The Templates shall be steel boosts where considered
			necessary by the Engineer-In-Charge. In case actual members are used as templates for drilling similar pieces, it will be at the discretion of the EIC to decide whether such pieces are fit to be incorporated in the finished structure. The contractor shall arrange for corresponding parts of each unit manufactured form the same drawings to be inter-changeable, as far as economic manufacturing conditions permit, and shall advise the EIC of the precise arrangements made in this respect.
		8.3.8.2	**Shop Painting:**

			The steel work shall be thoroughly cleaned to remove all rust, loose mill scales, drift and others foreign materials. Greasy and oily surfaces shall be cleaned with solvent and dry rags. Unless otherwise specified the contractor shall not flame to clean or pickle the steel work prior to painting. Painting shall generally be done immediately after the cleaning. All steel work shall be given a coat of epoxy paint in the shop. Each coat shall be allowed to dry thoroughly before the subsequent coat is applied. The steel parts to be encased in concrete shall be thoroughly cleaned but shall not be painted or oiled. This clause shall be read in conjunction with the sectionrelating to painting.
		8.3.8.3	**Weight for Billing:**
			Weights calculated for the purpose of billing shall be on the basis of the approved drawing and bill of material sheets. No deductions shall be made for cuts, holes etc.
		8.3.8.4	**Site Painting:**
			After erection, the whole of the steel work shall be thoroughly cleaned and all dirt marks, grease and overspills of primer paint removed. Areas, where the shop coat has suffered damage or deterioration, shall be cut back and repainted with primer in the same manner as in the shop. All exposed surfaces of metal bolt heads and connections left unpainted in the shop shall be similarly treated. After this preliminary work of making good has been approved by Engineer-In-Charge, all surfaces shall be thoroughly washed down with fresh water and when dry, two finish coats of epoxy paint shall be applied, at no extra cost to the department and shall be deemed to be included in the contractor's rate.
		8.3.8.5	**Welding:**
			Metal arc process shall be used for welding in all cases, unless otherwise specified by the Engineer-In-Charge. The welding procedure shall be in accordance with the requirements of IS: 816 "Code of practice for use of Metal arc welding for general construction in Mild steel". Electrodes used for hand welding or for automatic welding machine shall conform to IS: 814 "Covered Electrodes for metal arc welding of mild steel".

		8.3.9	**Special Features – Concrete:**
		8.3.9.1	**Anchor Bolts and Miscellaneous Steel sets in Concrete:**
			Wherever required, fixtures, anchor bolts for structural steel, P.V.C. or any other approved pipes for pressure relief, openings for cross drainage pipes and equipment etc., shall be set in the forms before concrete is poured. All anchor bolts shall be provided with suitable nuts and washers, The anchor bolts and miscellaneous steel shall be set in the forms or in the templates especially provided for this purpose.

			The location and projection of anchor bolts and miscellaneous steel shall be checked by the EIC immediately before the concrete is poured and again when the concrete has set sufficiently to permit access. The threaded projecting part of the anchor bolts shall be protected by means of grease wrapped with clean rig. All items, which have been displaced while pouring concrete, shall be removed and replaced at the Contractor 's expense and to the satisfaction of the Engineer-In-Charge/PMC. Steel surfaces that are in contact with concrete shall not be painted.
		8.3.9.2	**Ready Mix Concrete (RMC):**

			Ready mix concrete may be considered for adoption by the Engineer-In-Charge at the request of the contractor subject to satisfy the strength requirements for relevant items of contract and duly complying with the following conditions. i) The relevant details of Design Mix Concrete as specified shall be applicable along with the following specific details for Ready Mix Concrete. ii) The contractor shall use Ready Mix Concrete (RMC) of grades as specified. RMC shall conform to the requirements as per IS: 4926 and IS: 2000. iii) RMC shall be procured by the contractor from any RMC suppliers as approved by the EIC after verification of the plant and various infrastructure facilities including testing and quality control of materials and concrete at the plant lab and their method of transportation and placing of concrete at site etc. iv) Specification for materials / water etc., as given in the tender schedule for relevant grades ofconcrete shall hold good for R.M.C. v) Slump of concrete shall be as per IS:456: 2000. vi) Initial mix design from R.M.C manufacturer's shall be submitted by the contractor in quadruplicate with complete data adopted for mix design should be taken into account the aspects such as loss of workability and strength during transportation, till placement of concrete for approval of Engineer- mIn-Charge/PMC. vii) R.M.C manufactured and supplied shall be in conformity with the initial mix design approved by the EIC. Any change shall be made only withapproval of EIC after necessary revisions to the mix design. viii) The contractor shall ensure that all facilities are made available by the manufacturer of RMC at the plant for the department officials to inspect the materials incorporated, test carried out for all materials, concrete etc. Necessary communication system for control of quality of RMC shall be ensured at the place of production and at site of work by the Contractor. Copies of all the tests carried out for materials used / concrete shall also be made available to the department. ix) The concrete shall be transported in concrete transit mixer and agitators conforming to IS: 5892. x) The concrete shall be delivered and placed in foundation, slabs, beams cast with the slabs etc.,

			by pumping using BOOMP for locations like piles, pile caps, main cross beams, longitudinal beams, deck slab and wearing course and Marine Civil Works where putting the RMC using BOOMER is not possible / not desirable considering the thrust of flow of concrete .The RMC will be required to be placed on a nearby PCC platform and then conveyed from there manually and placed in these locations. The decisions as to whether the RMC can be placed by pumping or not shall be decided by Engineer-In-Charge, whose decision shall be final and binding. The contractor will not have any extra claim on this account. xi) The pumps and pumping arrangements shall be inspected and approved by EIC before approving the RMC manufacturer. xii) No water / admixtures shall be allowed after initial mixing of concrete at the plant. xiii) Slump test shall be carried out at site by the department/PMC in presence of contractor and representative of RMC manufacturer. The concrete shall be placed in position within the designed initial setting time and at the end of initial setting time. The record indicating the following details duly signed by the competent representative of RMC manufacturer, contractor, EIC/PMC shall be maintained. xiv) Date of delivery. xv) Time of mixing. xvi) Time of delivery at site. xvii) Quantity and grade of RMC. xviii) The contractor shall enter into an agreement with the approved RMC manufacturer to ensure compliance of above aspects. The overall liability to the department, for the RMC supplied shall rest with the contractor only. The department shall not be liable for any problems with the RMC manufacturer. xix) The calibration and weighing equipment accuracy certificate as per IS: 4926 shall be submitted by the contractor to the Engineer-In-Charge for approval.
		8.3.9.3	**Expansion Joints:**
			The contractor shall provide all labour, supervision, materials, equipment and tools to carry out the work to the entire satisfaction of the Engineer-In-Charge. The expansion joints shall be formed at the locations and levels approved by the EIC. Instruction of the manufacturers of the approved materials shall be followed while preparing expansion joints.

SECTION–9

DRAWINGS

(to be provided by the Owner)

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
Civil Engineering Department

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DRAWINGS

Name of work: **"DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK OF KDS - SMP, KOLKATA"**

DRAWINGS LIST:

The following Drawings shall from part of the Contract for the purpose of Tendering and shall be signed by the Engineer-in-charge and the Contractor for identification. The drawings can be downloaded with Tender documents.

Sl. No.	Description
1.	Existing Drawing of Old 7,NSD Berth
2.	Sketch for Berth No. 7 & Stack Yard
3.	Layout of N.S.Dock

Supplementary Drawings, if any, which the Engineer-in-charge may issue from time to time or approve during the execution of the Contract will also from part of the Contract.

After placement of work order during Engineering stage of the contract, the detail drawings on the basis of detail design prepared by the contractor and submitted to the Engineer-In-Charge and after approval of the same by EIC all those drawings and design report will be the part of the contract.

DRAWINGS

1. EXISTING DRAWING OF OLD 7,NSD BERTH : -

2. SKETCH FOR BERTH NO. 7 & STACK YARD:-

3. LAYOUT OF N.S.DOCK:-

SECTION-10

Important Project Parameters/Project Related Information

SYAMA PRASAD MOOKERJEE PORT, KOLKATA
Civil Engineering Department

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NAME OF WORK: "DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S. DOCK, KDS, SMP, KOLKATA".

1. All materials and workmanship shall conform to the appropriate Indian Standard Specifications, code of practice published by the Bureau of Indian Standards (BIS), of latest versions where they have been formulated of the contract special conditions and as per the instructions of the Engineer-in-Charge/ PMC of the work from time to time. Standards issued elsewhere may be used if approved by the Engineer-in-Charge/ PMC for those items of work only for which appropriate Indian Standards do not exist.

2. The contractor has to make his own arrangements regarding temporary stores, work sheds ,labour hutment etc., at his own cost. Land for such work sheds, stores, site office etc., till the work is completed will be given free of rent at a spot approved by the Engineer-in-Charge/ PMC. The temporary sheds shall be constructed with non-inflammable materials like G.I. sheets etc., and shall be removed in reasonable time after the work is completed. In case the Contractor fails to remove the same as aforesaid, the department will remove the same and cost of such removal will be recovered from any amount due to the contractor.

3. If any land is required for labour sheds, Erection of bathing plants etc , the same will be given on rent basis at prevailing rate under the existing rules of the Port Trust at a spot approved by the Engineer-in-charge, subject to availability.

4. A site order book is to be kept by the contractor at the site of work. Any orders and/or instructions issued by the Engineer-in-Charge/ PMC or his authorized representative shall be entered in this book and shall be deemed to have been legally issued. The contractor shall sign each entry in token of having seen the same. This site order-book shall be returned to the Engineer-in-Charge/ PMC in good condition after completion of the work.

5. The contractor is responsible for taking precautionary measures for the safety of the lives of the workmen working under him and the responsibility arising due to any mishap during the execution of work, the payment of any compensation etc., lies entirely on the part of contractor.

6. The workers engaged on water front works such as concrete / masonry works, etc., on the dock side face of the structure should invariably be provided with safety life jackets to ensure safety of lives of the workmen. It is the responsibility of the contractor to have adequate number of safety lifejackets at site and also to ensure that the workmen engaged on water front works invariably wear the safety life jackets. The responsibility arising due to any mishap during the execution of work, the payment of any compensation etc., lies entirely on the part of the contractor . Barricades and vigils, safety lamps, flags, signals etc., for temporary traffic diversions etc., required during execution and progress of the work shall be produced by the contractor at his own cost. Risk and responsibility entirely lies on the part of contractor . No claim in this regard shall be entertained by the department for delay in time schedules consequent on the negligence will be to the contractor's account.

7. The Port working hours are from 8.00 A.M to 1.00 Noon and from 2.00 P.M to 5.30 P.M. on all working days. However the work will be allowed round the clock on working days, Sundays and Holidays ,which will be approved by the Engineer-In-Charge on written request of the contractor. Necessary supervision will be arranged by the SMPK/PMC without any extra cost to the contractor.

8. The notice inviting tenders etc. shall form part of contract.

9. All the rules and regulations governing the SMPK shall be applicable ON THIS WORK..

10. The work shall be carried out without causing any damage to the Port property or hindrance or inconvenience to the operation of the Port, working of the Port machinery. Any damages caused to the Port property either directly or indirectly shall be made good by the contractor at his own cost.

11. All the claims of the Port Trust against the contractor OR any other transaction whatsoever will be recovered from the amounts due to Contractor to this account.

12. The contractor shall employ experienced and qualified Engineers to receive instructions from the Engineer-in-Charge or his authorised representative/ PMC, and to carry out the work in accordance with the specifications. The contractor (s) or his competent authorised agent previously approved in writing by the Engineer-in-Charge/ PMC is to be constantly on the works and shall give his whole time to the superintendence of the same. In case the contractor fails to employ a qualified and experienced civil engineer and Supervisor, an amount of Rs.50,000/- and Rs30,000/- respectively per month will be recovered from the running bills.

13. During excavation for foundations, the Contractor shall dismantle and remove any masonry or concrete or roots or stumps trees stray objects of tough nature if met with, as directed by the Engineer-in-Charge/ PMC at no extra cost to the department.

14. Water and drainage pipe lines electrical, telephone, I.T. and server cables etc., if any, met with during the execution of work are to be suitably lowered or diverted from the site of work by the contractor as directed by the Engineer-in-Charge/ PMC at no extra cost to the department.

15. The contractor is responsible for the safe custody of the materials collected and stacked by him until incorporated in the work, measured and handed over to the department.

16. RETURNS AND DRAWINGS:

All reports, statements, diagrams or drawings etc., which the Contractor is required to submit during the progress of the works to the Engineer-in-Charge/ PMC, or to his representative or to both are unless otherwise directed to be furnished in triplicate, and at the expense of the Contractor.

17. DRAWINGS OF TEMPORARY WORKS:

When the Contractor intends to start erecting any part of the temporary works and stagings required for carrying out the works he shall furnish to the Engineer-in-Charge/ PMC well in advance complete drawings of that part of the temporary works and stagings. The Contractor shall at the same time, if so required by the Engineer-in-Charge, furnish calculation relating to the strength and anticipated deflections in respect of such temporary works. The Contractor shall also furnish to the Engineer-in-Charge/ PMC, drawings showing the method proposed for the erection of the various part of the works. These details arerequired for a General Review of satisfactory performance.

The furnishing to the Engineer-in-Charge/ PMC of any design for any of the temporary works and staging shall not relieve the Contractor of any liability or obligation under the contract in respect of such temporary works and stagings.

18. CONTRACTOR TO WORK TO OTHER CONTRACTOR(S)'S DRAWINGS:

The Contractor(s) shall where so directed by the Engineer-in- Charge, or his representative be required to work to other contractor's drawings where-so-ever drawings for work not included in this contract are related to particular details of the works.

a) Handing over site: The tenderer shall note that the entire site may not be handed over to the contractor at a time. This may be handed over in a phase manner and definitely the same should not hamper the progress of work in any way. Contractor should plan accordingly and submit CPM /Progress schedule to Engineer-In-Charge/PMC.

b) Detailed CPM Schedule: The Contractor shall submit to the Engineer-in-Charge/ PMC, within 15 days from the date of placement of work order, a computer based detailed CPM Schedule on MS Project/Primavira of various activities to be performed in the project to be based on his preliminary time Schedule supplied with the tender and approved by the Engineer-in-Charge/

PMC, showing in an approved form the estimated dates of commencement and completion of various parts of the work including anticipated dates for delivery, erection, etc., of the various sections of the work for the contract. The detailed CPM schedule shall be updated by the Contractor at suitable intervals determined by the Engineer-in-Charge/ PMC, and 3 (Three) copies of same should be deposited to the Engineer-in-Charge/ PMC. The Contractor shall take into account all anticipated delays due to bad weather, cyclones, and heavy rains while working out the CPM Schedule using M.S.Project/ Primavira.

19. PROGRESS REPORTS:

The Contractor shall submit to the Engineer-in-Charge/ PMC on the first day of each week or such longer period as the Engineer-in-Charge/ PMC may from time to time direct, a progress report for the preceding period showing up to date progress and progress during the previous period on all important items of each section or portion of the works in relation to and in consideration of detailed C.P.M. Schedule.

20. RETURNS OF LABOUR:

The Contractor shall if required by the Engineer-in-Charge/ PMC, deliver to the Engineer's representative or at his office a return in detail in such a Form and at such intervals as the Engineer may instruct showing the supervisory staff and the numbers of several classes of labour from time to time employed by the Contractor on the site and such information of constructional plants & equipments as the Engineer-In-Charge or his representative may required.

21. The contractor shall forthwith dispatch at his own cost raise and remove any craft or plant (Floating or otherwise) belonging to him (including also any plant which is held by the contractor under agreement for hire or hire-purchase) which may get damaged and sinks in the course of construction, completion or maintenance of the works or otherwise deal with the same as the Engineer-in-Charge/ PMC may direct and until the same shall be raised and removed by the contractor shall set all such buoys and display at night such lights and do all such things for the safety or navigation as may be required by the BoT. In the event of the contractor not carrying out his obligation imposed upon him by this clause, the Board may remove the same and the contractor shall bear such cost incurred on that by the client..

22. LIFE SAVING AND FIRST AID APPLIANCES:

The Contractor shall at his own expense provide and maintain upon the works to the satisfaction of the Engineer-in-Charge/ PMC sufficient, proper and efficient life saving and first-aid appliances which shall at all times be available for use at site of work.

23. LIGHTS AND SIGNALS:

Any light provided by the contractor shall be so placed or screened as not to interfere with any signal or navigation lights or other markings.

24. PROPERTY IN EXCAVATED MATERIALS:

All materials and objects of any kind obtained from excavations or found on or under the site or under any additional site which the contractor may be allowed to occupy for work shall remain the property of the board and shall not be used in the works or sold or otherwise disposed of without the written permission of the Engineer-in-Charge/ or his representative unless otherwise explicitely provided in the specification. No excavations are to be made upon the site or additional site beyond those shown on the drawings or described in the specification without the prior written permission of the Engineer-in-Charge/ his representative.

25. TEMPORARY OFFICE ETC.:

The Contractor(s) shall submit to the Engineer-in-Charge/ PMC for his approval, drawings and proposals for any temporary work such as office, store, pre-casting yard, batching plant etc., which he intends to construct for execution of the main work and no such work shall be constructed before obtaining the written approval of the Engineer-in-Charge.

26. ENTRY ON PRIVATE OR OTHER PROPERTY:

The Contractor shall not enter upon or commence any work in or upon, across or through any land, building or place being private property until authorized in writing by the Engineer- in-Charge or other Competent Authority to do so.

27. BRIBES AND COMMISSION:

Any bribe, commission, gift or advantage given, promised or offered by or on behalf of the Contractor or his partner, agent or servant or any one, on his or their behalf to any officer, servant, representative or agent of the Engineer-in-Charge/ PMC or to any person on his behalf in relation to the obtaining or to the execution of this or any other contract with the Board shall in addition of this or any criminal liability which he may incur subject the Contract leads to the cancellation of his and all other contracts with the Board and also to the payment of any loss or damage resulting from any such cancellation. The Board shall be entitled to deduct the amounts so payable from any money otherwise due to the Contractor under this or any other contract. Any question or dispute as to the commission of any offence under the present clause shall be settled by the Engineer-in-Charge/ PMC in such a manner and on such evidence of information as he shall think fit and consider sufficient and his decision shall be final , conclusive and binding on the contractor.

28. ADVERTISING:

No advertisement may be placed on any boarding fencing building or scaffolding erected in connection with this contract without the written permission of the Engineer-in-Charge or his representative.

29. CONTRACT SUPERCEDES PREVIOUS DOCUMENTS:

The Contractor shall have no right to any increase Lump Sum rate in the contract nor any other right whatsoever by reason or any representative explanation or statement made or by reason or any information promise or guarantee given or alleged to have been given to him by any person (whether in the comply of the board or not) before the date of the contract is being understood that the contract embedding the whole arrangements between the parties with reference to the contract here by constituted and all previous correspondence, negotiations, representations, explanations statements, promises, or guarantees whether oral or written shall be executed.

30. NOTICE OF OPERATION:

No important operation shall be commenced nor shall work outside the usual working hours be carried out without the consent in writing of the Engineer-in-Charge/ PMC or without full and complete notice also in writing being given to him sufficiently in advance of the time of the operation, so as to enable him to make such arrangements as he may deem necessary for his inspection of PMC and his team.

31. SURVEYS AND LEVELS TO BE AGREED:

Before the works or any part thereof are begun the Contractor or the Contractor 's representative and the Engineer-in-Charge or his representative/PMC shall together

survey and take levels of the site of the works both above and below water level and agree all particulars on which the survey is to be made and on which the measurements of the works are to be based. Such particulars shall be plotted by the Contractor and after agreement the drawings shall be signed by the representative of the Engineer-in-Charge/ PMC and the Contractor or contractor's representative and shall form the basis of the measurements for the certificates of the Engineer-in-Charge/ PMC.

The Contractor (s) shall arrange at his cost all equipments/instruments, materials and workmen to carry out the joint survey. Failing such survey and agreement being prepared and/or signed by the Contractor or contractor 's representative, the Surveys of the Contractor is conducted by the Engineer-in-Charge/ PMC,the cost of which shall be born by the contractor and same shall be final and binding on the contractor.

32. NOTICE FOR SETTING OUT OF WORKS:

The Contractor shall give the Engineer-in-Charge/ PMC not less than 24 hours notice in writing of intention to set out or give levels for any parts of the work in order that arrangements may be made for checking. In the absence of such request any delay will be to the contractor's account.

33. JOINTMEASUREMENT OF EXTRAS:

As the same is a Turn-Key contract(Lump sum),usually there will be no excess-extra work. In the event of the contractor having to execute any work as per the written instruction of the Engineer –In-Charge which is not in the scope of this project and in regard to which the contractor may propose to claim extras, he shall immediately notify the Engineer-in-Charge in writing and shall at once make arrangements to take the measurements of the said work with the Engineer-in-Charge/ PMC and the payment will be made on mutually agreed rate based on PWD/CPWD schedule of works..

If these measurements are not taken jointly and booked and agreed at the time of the work is being executed, the Contractor 's measurements will not afterwards be recognized by the Engineer-in-Charge/ PMC.

The fact of such joint measurement having been made will in no way commit the Engineer-in- Charge to a recognition of the claim if he considers such claim without foundation. The Engineer-in-Charge/ PMC shall at all times have full access to the Contractor 's extra works with the contractor 's time book and daily check the time of any extra works with the contractor's time keeper or otherwise be the fact of his agreeing upon any time shall in no way bind the Engineer-in-Charge/ PMC to value the work other than by measurement if he thinks fit so to do.

34. ORDER OF WORKS:

The order in which the works are to be carried out shall be always upon approval of the Engineer-in- Charge or his representatives and shall be such as to suit the detailed method of construction adopted by the Contractor as well as the C.P.M. Schedule. The works shall be carried out in such a manner so as to enable the other contractor to work concurrently.

35. OPERATIONS OF THE EMPLOYER AND OTHERS:

The Ordinary business and works of the Board and others as carried out on and in the vicinity of the site will be continued during the construction, execution and maintenance period of the works and the contract shall be conducted in such a way so as to avoid interference with traffic of any kind by land and by water and with any other works in progress in the vicinity and never disturbing normal operation of Port.

36. SANITARY FACILITY:

The Contractor shall provide and maintain in a clean and sanitary condition adequate latrines and wash places which may be required on the various parts of the site for the use of his employees to the satisfaction of the Engineer-in-Charge/ PMC. Any pollution activities will be permitted at site of work unless otherwise necessary for the execution of the work. The Contractor shall make all arrangements for the disposal of sewage or drainage in accordance with the directions of the Engineer-in-Charge/ PMC.

37. TELEPHONE:

The Contractor (s) shall make his own arrangements with the appropriate authority for the provision of telephone/illumination facilities to the site/site office as contingency of the contract.

38. EXISTING SERVICES:

Drains, pipes, ITcables, overhead wires and similar services encountered in the course of the works shall be guarded from damage by the Contractor at his own cost, so that they may continue in full and uninterrupted use to the satisfaction of the owners thereof, and the Contractor shall not store materials or otherwise occupy, any part of the site in a manner likely to hinder the operation of such services. Should any damage be done by the Contractor to mains, pipes, cables or lines whether above or below ground whether shown or not shown on the drawings the Contractor must make good or bear the cost of making good the same without delay to the satisfaction of the Engineer-in-Charge/ PMC and of the owners.

39. KEEPING SITE CLEAN:

The Contractor shall at all times keep the site free from all surplus excavated materials, rubbish and offensive matter which shall be disposed of in a manner tobe approved by the Engineer-in-Charge . Such clearance and disposal of wastes and other materials shall be a contingency of the Contract.

40. INDIAN CONTRACT:

The contract shall be interpreted and have effect in accordance with the law of Indian and no suit or other proceedings relating to this contract shall be filed or taken by the Contractor in any court of law except in KOLKATA.

41. The contractor shall note that the work under this contract is to be executed in the Dock Basin of NSD, which is under operation and ships of various sizes, Dredgers and other Floating Crafts will be moving in the area. The contractor shall take all precautions to prevent any damages to any part of the work under progress of works completed and under maintenance and also the temporary works completed and contractor, floating crafts under his custody, etc., due to drifting of the crafts referred to above. The Board will not take any responsibility for such damages and the contractor has to make good all such damages caused to Port craft, equipment and structures at his cost.

42. The contractor should note that the work site is situated within the restricted /Custom Bonded area. He should obtain necessary passes for himself, his workmen and vehicles and materials from the Commandant, CISF after paying necessary charges and should abide any prohibitory rules and regulations in force and no claim on this account will be entertained.

43. The contractor shall note while dismantling the pipelines etc., utmost care shall be

taken not to damage them and the retrieved materials have to be handed over to place shown by the Engineer-in-Charge/ PMC as per relevant item. All serviceable materials to be forwarded to Trustees Material Management at their designated area as directed by EIC.

44. The tenderers shall note that the construction yard for the work will be given to the minimum requirement subject to not affecting the traffic operations and no claim will be entertained on this account.

45. STORAGE OF AGGREGATES:

The Contractor shall specifically note that the fine and coarse aggregates shall be stored at site neatly in separate bins properly covered by tarpaulins etc., to prevent contamination. The aggregates shall comply to the standards/specifications.

46. HANDLING OF CEMENT FOR THE DAY'S WORK:

The Contractor shall arrange at his own cost for proper storing of cement for the day's work. Necessary water proof covering (tarpaulins etc.,) shall be invariably provided to protect the cement whether rain or no rain.

47. During the currency of the contract, the contractor (s) shall take all necessary care to see that no material such as dismantled materials, debris etc., are thrown into the waterway and great care and meticulous supervision are best owed in this regard.

48. The contracts shall not prefer any claim with regard to in—in rates of any material or labour covered by the subject contract and the direction of the competent authority is final and cannot be subject matter of arbitration.

49. The contractor shall produce documentary proof to the satisfaction of the Chief Engineerin token of having paid the mineral revenue due to the government by the contractor if hehas procured the minor minerals directly from the quarries under the relevant acts, rules andregulations of the state/central government or shall obtainand produce such documentary evidence from the person who operates the quarry. The said documentary evidence shall disclose the payment of Mineral Revenue due to the Government for the quantity of the Minor Mineral removed from the said quarries.Till such time, the contractor produces the above documentary evidence, the seignior age fees etc.,shall be recovered from the running on account bills and kept in deposits and the same will onlybe released to the contractor on production of the said documentary evidence. If for anyreason the contractor fails to produce such documentary evidence during the period ofcontract, the contractor shall produce Mineral Revenue clearance certificate, issued by theCompetent Authority of the Mines& Geology department to enable refund the pertinentamount. The contractor fails to produce this mineral revenue clearance certificate from thecompetent authority, the amount so recovered from the running on account bills as mentionedabove on the quantities consumed on the work in question, will be remitted to the Mines &Geology department and there after pass the final bill in the contract in question. In termsof G.O.Ms.No.23dt.5.3.1999 issued by W.B. State Irrigation and Command Area Development.

50. The department reserves the right to execute the contract strictly according to the provision of the tender.

51. All concrete works etc., shall be kept wet and properly cured with fresh water as per I.S. Specifications. If curing is not done properly the department will be at liberty to engage labour for curing and the expenditure will be recovered from the Contractor 's bills. The decision of the Engineer-in-Charge will be final in this regard.

52. The contractor should submit daily labour report, ground balance of the materials on the day, his day's programme of work in the proforma in the early hours of everyday.

53. The contractor shall programme his work in such a way there is no obstruction to normal functioning of the works/shipment. The materials shall be stacked in such a way that no obstruction is caused to the movement of the traffic in the area.

54. All conversions from Metric Units to British units and vice-verse will be as per I.S. 786.

55. Whenever sizes are referred to in British units in the tender document equivalent or nearest one in metric units will be accepted.

56. Curing of all cement works should be done at the contractor's cost as directed by the Engineer-in-Charge/ PMC.

57. The contractor should see that no obstruction is caused to the normal working of the Port staff working in the locality and should co-operate with other contract agencies working in that area simultaneously without any claim whatsoever.

58. In case, any site wherein the contractor 's materials such as debris, gravel, sand, metal, stoneetc. are lying is required to be cleared off for giving any markings or taking up any other newworks, the contractor should clear the site within three days from the date of receipt of instructions from the department without any extra cost to the department. In case, they arenot cleared within 3 days, they will be removed eitherby the department or through other agencies and the cost of such removal will be recovered from the contractor's bill.

59. Steel should be stacked in such a way to give easy identification and counting of the various diameters of the bars. The steel yard at site should be kept clean and all the cut pieces etc., should be separately stacked. All the construction materials is required for the work should be collected and stacked in such a way not to give any hindrance for the other contract works in that area. The Engineer-in-Charge/ PMC's decision and instructions given from time to time shall be binding and no claim is tenable on this account.

60. All reinforcement and other steel shall be cleared free from oil, grease, loose, mill scales, loose rust or other deleterious matter before incorporating in the work.

61. Great care shall be taken by the contractor to prevent displacement or bending of the members of the steel. Any displacement shall be adjusted and fixed in position before commencement of work at no extra cost to the department.

62. The contractor has to provide necessary helmets as safety-measures for his staff/workers to avoid any untoward incidents at site of work at his own cost.

63. Any vegetation etc. should be cleared by the contractor at no extra cost to the department.

64. All defective works pointed out by Engineer-in-Charge/ PMC shall be rectified free ofcost during execution and maintenance.

65. The contractor shall barricade the area where the work is in progress and shall provide necessary caution boards. During nights necessary signal lights shall be provided to

prevent any mishaps. No extra claim will be entertained for all these works.

66. Every effort will be made to handover the site to the contractor as soon as the work order is given. In case the entire site is not handed over to the contractor , he should programme his work in such a way so as not to hamper the progress in anyway.

67. The decision of Engineer-in-Charge is final in case of any technical clarification.

68. The contractor shall submit the test certificates/guarantee cards and other information pertaining to the material used on demand.

69. The offer price quoted by the contractor should be inclusive of all labour and materials etc. unless otherwise specified.

70. The tenderers are expected to see the plans on any working day during office hours and obtain such clarifications and if necessary to inspect the site of work and study the site conditions and make preliminary design before quoting his rate in the tender. No claim whatsoever will be entertained at future date arising out of local working conditions and clarifications given in the department.

71. Security and safety Required:
The contractor (s) shall comply with all regulations imposed by the customs and Port Security Authorities in respect of the passage of plant, vehicles materials and personnel through customs barriers.

72. Safety Precautions:

i. Fire safety precautions:
The contractor (s) shall make all precautions to prevent out-break of fire and accidents on the site of machinery, men, materials, office, stores and other places connected with the works directly or indirectly. He shall comply with all rules, regulations and orders if any statutory authority and of the Engineer-in-Charge/ PMC at no extra cost of the Board and he should include all the charges in the contract rates.

ii. Restricted Areas:
The contractor shall obtain from the Board details of any restricted areas in and around the site and shall have prominently and clearly, displayed for the information of his staff and work people, notices defining any such restricted area. Such notice shall be provided at his own expenses.

iii. The contractor shall give every facility to the authorized safety officers of the board to inspect the works when so ever required and shall observe and abide by and instructions by the Engineer-in-Charge/ PMC in regard to the use of plant, equipment and temporary works in respect of general safety. Compliance with such requirement shall not be used as the basis of claim against the Board.

73. Service lines such as electrical cables, Fibre-Optical, T-cables, water supply lines sewer and drainage pipes, Tele communication cables etc. are embedded in the Port Roads, road side berms hard surfaces areas, pavements etc. The Fiber Optical I.T. cable is very costly cable and if damaged requires replacement for full length.

The contractor therefore, before commencing any excavation shall seek the specific clearance of the route proposed for excavation. Not withstanding such approval he shall be responsible to takenecessary precautions by way of deploying suitable means and restraint to avoid damage toany of the service lines. In case of any damage caused during excavation or subsequently duringthe progress of thework he should replace/repair the cables/service pipe lines etc. as required at his cost, failing which a

recovery as evaluated by the Engineer-in-Charge/ PMC would be made from the bills.

74. PROGRESS PHOTOGRAPHS , VIDEO FILM and CCTV monitoring:

The contractor shall supply for the Engineer-in-Charge photographs, video of performance of work in both soft and hard form time to time during progress of work.

The contractor shall also supply to the Engineer-in- charge colour, edited progress video film/DVD with sound and narration in English of such portion of the work in progress and completed as the Engineer-in-Charge/ PMC may direct so as to have coherent record of the construction from start to its completion. These will be required every month. The film shall becomethe property of the board and no copies of the above film shall be supplied to any person or persons without the permission of the Engineer-in-Charge/ PMC. The photos and video film shall cover all impartment activities of entire work. The contractor also arrange for a CCTV surveillance for working activity of the project and arrange display at four locations for monitoring of the progress of work as directed by the Engineer-In-Charge. The cost of the progress photographs , video film & CCTV installation will born by the contractor.

75. Up-keeping of Environment:

The contractor shall take precautionary measures and adhere to the following for up-keeping of the environment at site of work, at no extra cost to the department.

a) No tree/Plant should be cut or removed without the written permission of the Engineer-in- charge.
Contractor shall make necessary arrangements, to reduce the dust general by
   i. Regulating the speed of the construction equipment.
   ii. Sprinkling of water wherever required.
   iii. Prevent over loading of trucks and spillage of materials.
   iv. Cover trucks with tarpaulins.

Contractor shall not tamper any hydraulic flow including drainage, rain harvesting pits, catchment drains etc.

76. Water Supply:

The contractor shall make his own arrangements for supply of water of the work and the workmen. The contractor shall arrange for sufficient capacity of water tanks at site of work for curing of concrete.

77. Power Supply:

The contractor shall make his own arrangement for the power required for the work.

However, construction power to the extent possible may be made available to the contractor from the nearest source depending on availability and as per the prevailing rules. In case additional power over and above that is required for use in the construction, the same can be considered subject to satisfaction of EIC about such requirement. The contractor shall submit the details of connecting loads that he intended to use. The contractor shall construct his own LT lines from the place of supply for meeting the construction loads LT lines shall meet the required standards specified under Indian Electricity Rules 1956 and Indian Electricity Act 1970, and complete the installation shall be approved by the Port Electrical wing of Mechanical department. The contractor(s) shall pay for electrical consumption charges at the rates prevailing in vogue from time to time. Irrespective of contractor electrical power consumption, monthly minimum charges as per prevailing rates will be recovered from contractor’s running bills.

78. Life Jackets:

The workers engaged on waterfront should invariably be provided with safety lifejackets by the Contractor at his own cost to ensure safety of life of the workmen. It is the responsibility of the Contractor to have adequate number of safety lifejackets at site and also to ensure that the workmen engaged on waterfront invariably wear the safety life jackets. Also adequate number of life buoys should be kept at site of work as an additional safety measure.

79. Light and Signals:

Floating platform / craft shall display day and night signals as directed by the EIC. The Contractor shall at all times be responsible for ensuring that moorings which may be required in connection with the works do not impede or endanger traffic in channel.

All anchors or other securing devices for moorings are to be placed in accordance with the requirements of the EIC. The Contractor shall ensure that the EIC is provided with an accurate fix of the position of all anchors, securing devices and mooring lines as and when this information is required.

All attendance crafts concerned with the work, shall display navigation lights, when moored to buoys in the Port and shall not obstruct other Port Traffic.

80. Maintenance of Floating Platform/Craft:

All plants and floating platform / craft shall be in good working order to the satisfaction of Engineer-in-Charge/ PMC and shall be maintained in seaworthy condition and shall be certified as such by authorised surveyors. All craft of the Contractor shall have valid license given by SMPK and shall strictly comply with SMPK Regulations.

81. Filling in Holes and Trenches:

The Contractor immediately upon completion of any work under the contract shall at hisown expenses fill up all holes or trenches which have been made or dug, and clear away allrubbish occasioned in the execution of the works or temporary works. The Contractor shall bear and pay all costs, charges, damages andexpenses which may be incurred or accident which may happen by reason of holes and trenches connected

With the work being left unfenced or materials being leftunfenced or placed in improper situations.

82. Shoring and Strutting:

Necessary shoring and strutting arrangement shall be made by the contractor to ensure avoiding side collapse of adjacent soil while carrying out the work.

83. Datum–Tidal Working:

All datum will be as per KODS

84. Environmental Considerations:

The Contractor shall refrain from using plant which makes excessive noise, particularly during the hours of darkness, which shall be limited to 45 db (A) at a distance of 100m from the boring andother plants.

85. The floating Craft/Platform shall contain all arrangements for inspection of Bridge Deck Structure etc.

86. The platform shall have sufficient dimensions and strength to carry all the equipment

and manpower and contain sufficient space for movement

87. Sufficient anchorage shall be provided to the platform against waves, currents,wind etc., to stop the lateral movement of the platform.

88. The bed level shall be attained through lead soundings for accuracy.

89. If any forged/fake documents are submitted by the tenderers, their business dealings withSMPK will be banned".

90. The contractor/ Firms while quoting tender shall note that, no post tender negotiation will be held with the L-1 tenderers, except in exceptional cases, whenever it is found necessary.

91. The contractor(s) or his authorised representative shall invariably sign in the hindrance register, which shall be maintained by the concerned division at site of work. The hindrances in execution of work will be recorded in the register, whenever any hindrance takes place, which shall be maintained by the concerned division at site of work and the same shall be reviewed by the Engineer-in-Charge/ PMC from time to time to examine the justified reasons for considering extension of time etc.,

92. The bidder shall give an undertaking that they have not made any payment or illegal gratification to any person/authority connected with the bid process so as to influence the bid process and have not committed any offence under the P.C . Act in connection with the bid.

93. In the event that two or more bidders quote the same amount (the "Tie Bidders"), the authority shall identify the selected bidder by draw of lots, which shall be conducted, withprior notice, in the presence of the Tie-Bidders who choose to attend.

94. In the case the document submitted by the bidder found to be not genuine, the management reserves the right not to allow to participate in future tenders of SMPK.

95. The bidders shall disclose any payments made or proposed to be made to any Intermediaries (Agents etc) in connection with the bid.

96. "The Bidder will have to give a certificate that their firm/ company is not having any relationship (Direct / Indirect) either personal or Commercial with any of the existing trustees of SMPK"

97. Tenderers shall submit the experience/completion certificates along with their tender.

MSME Conditions:

98. Micro and small enterprises registered with NSIC and ministry of MSME with adequate monitory limits are exempted from payment of tender cost and EMD amount for participating in SMPK. Tenders for the execution of works.

99. All the eligible Bidders, who are registered with NSIC/Ministry of MSME are exempted from payment of EMD amount and tender Document Cost subject to fulfilling of following conditions:

i. The Bidder should invariably submit a request letter claiming "EMD and Tender Document Cost exemption".

ii. The Bidder has to submit the self-certified copy of the registration certificate issued by NSIC/Ministry of MSME for the works/service relevant to the "Subject Tender" as per Pre- qualification criteria.

iii. The above registration certificate should be valid on the date of opening of the technical bid.

iv. The Monitory limit of the Registration Certificate shall be more than the "Amount put to Tender". In case the monitory limit of the above Registration Certificate is less than the

estimated cost (put to tender), then the above certificate will be treated as invalid for the subject tender value.

v. In case the Registration Certificate issued by NSIC/Ministry of MSME is found to be invalid (date expired) or insufficient monitory limit or irrelevant works or services i.e. other than the tendered works/services. Then the above Registration Certificate cannot be considered for exemption of EMD & Tender Document Cost and the Bid received will be treated as "Bid submitted without EMD and Tender Document Cost", which would attract disqualification under EMD & Tender Document Cost of tender conditions as mentioned above.

vi. In case the bid is submitted as an Indian arm of a Bidder and the eligibility criteria conditions were met thru foreign company, then the "EMD Exemption & Tender Document Cost cannot be claimed under the MSME status of Indian arm/Subsidiary.

vii. Copy of "Application for obtaining NSIC/ MSME Registration" of pending renewal of NISC will not be entertained. Such offers will be treated as Offers received without EMD and Tender Document cost.

100. The contractor shall be liable for authenticate verification of work men engaged in the work including obtaining proof of Aadhar Cards etc.,

101. The contractor shall engage experienced/skilled workmen at the site.

102. The contractor shall fulfill all the legal requirements regarding insurance, PF, ESI etc., to the workmen engaged in the work and shall comply all the QMS/ EMS/OHSAS existing norms of the organization.

103. The contactor/authorized representative shall monitor workmen round the clock and shall synchronize with the section in-charge from time to time.

104. The contractor shall be liable for any theft / damages occurred to the Port property due to his workmen mismanagement / carelessness / un-lawful activities etc., at site, the necessary recovery will be affected based on the actual assessment whatsoever from running account bills. The Engineer-in-Charge decisions the final in this regard.

105. If required, the construction agencies / Firms would provide Crèche at their camp offices/Labour work sites.

106. The contractor shall submit the proof of actual payment done (e-payment) tothe workmen engaged particulars to the Engineer-in- charge for processing running account bills (payment will be made only for prescribed persons in the work).

107. The bidder has to enter in to Pre-contract Integrity Pact Agreement prescribed in the pro-forma enclosed and has to be submitted along with the tender.

108. The bidder has to submit declaration (Declaration No.1) towards GST as prescribed in the pro-forma enclosed.

109. GST Conditions:

a) ***GST in respect Supply of Goods & Services or on works contract as applicable in respect of this contract should be payable by the supplier / service provider /contractor and ort trust will not entertain any claims with effect from 01-07-2017.***

b) ***According to GST Act every dealer is liable to be registered whose aggregate turnover exceeds Rs.20 lakhs for supply of goods / services / executing any works contract. Accordingly GSTIN is to be provided for participation in tender and to award the***

contract.

c) The applicable TDS as per the central GST (CGST) Act will be deducted as and when notified by the Government.

d) The rate to be quoted should be exclusive of GST component and payment will be made Against "Tax Invoice" as prescribed under the GST Act/Rules.

e) The supplier/contractor is required to remit GST as per the "Tax Invoice" and file the details in GSTR on or before10th of the subsequent month to enable SMPK to claim input tax credit otherwise the said tax invoice will be kept pending for payment.

(a) The rate quoted shall be exclusive of GST and GST as applicable shall be extra.

(b) The supplier/contractor shall have to provide HSN code/SAC code and the responsibility of applying the correct rate of Tax in GST regime shall be on the supplier/ contractor. The supplier / contractors is not entitled for any other taxes / cesses which are subsumed in GST except for applicable GST mentioned in the Tax Invoice.

(c) The Central excise duty, VAT and TDS on works contracts, Service tax, Octroi, Entry tax etc. which are subsumed in GST are no more applicable in the present GST.

(d) Supplier/Contractor is to submit Tax Invoice (for taxable supplies) as per the governing provisions of GST law and all the particulars which are mandatorily required to be mentioned in Tax invoice etc. shall have to be necessarily mentioned in such Tax Invoice. The amount of GST claimed in the Tax Invoice shall be final and any future claim by the supplier/contractor shall not be entertained by SMPK under any circumstances.

(e) In case of further change in the tax structure till the date of completion of work or incase any error is noticed in the calculation of amount payable / recoverable the same shall be paid by SMPK or else recovered from the bills or security deposits or any other amounts payable to the supplier/ contractor.

(f) In case the value charged / tax charged in the tax invoice is found to be less than the taxable value or tax payable in respect of such supply, the same shall not be entertained by SMPK unless the supplier / contractor who has supplied such goods or services or both, shall issue to the SMPK a debit note / supplementary invoice containing such particulars as may be prescribed.

(g) The supplier of goods/services/composite supplies/works contract or has to mandatorily remit the GST collected from SMPK to the Government. In case of any non-payment of GST by such supplier of goods / services / composite supplies / works contractor which has the adverse effect on the input tax credit availed by SMPK if any, such amount together with interest shall be recovered from the bills / tax invoices / any other amounts payable to the supplier/contractor.

(h) SMPK is liable to deduct TDS if applicable as per the provisions of Section 51 of CGST Act from the date notified by SMPK at the applicable rates.

(i) The components viz. Labour cess, TDS as per Income tax Act 2017, Seignorage fee etc. viz. taxes/ cesses which are not subsumed in GST shall be applicable as it is and there is no change in such recovery procedure and the same has to be continued.

(j) In terms of clear provisions under Section 171(1) of CGST Act, the supplier/contractor shall have to pass on the benefit in the form of reduction in prices in case there is any reduction in rate of tax on any supply of goods or services or the benefit of input tax credit. Accordingly, the contractor has to submit a Declaration (Declaration No.2) attached here with.

110. Conditions regarding Safety requirements:

a) The SMPK has Quality Management System (ISO 9001- 2015), Environmental Management system (ISO 14001:2015) and Occupational Health and Safety Management System (OHSAS18001:2007) for their activities. One copy of on solidated policy is enclosed herewith. The contractor shall comply with all the requirements of ISO9001:2015, ISO14001:2015 and OHSAS18001:2007 standard.

b) The contractor shall while carrying out the above work, abide by safety tasks, rules, regulations and procedures established by SMPK as pre-scribed in the manuals, HIRA format, work instructions, operational control procedures. Copies of the same will be made available to the contractor up – on request for reference.

c) The contractor shall abide by all Safety Standards and codes attributable to the material and goods to be delivered to site.

d) The contractor shall participate in safety awareness meetings held at site adhere to the instructions issued and shall also adhere to the safety programmes established by SMPK.

e) The contractor shall be responsible for health / safety of their personnel including workers during their work at site and correct any deficiencies in the above matters.

f) The contractor shall plan work activities so that all work will be done in compliance with the rules and regulations and procedure established by SMPK. and to follow safe working practices and keep site clean and neat.

g) The contractor shall ensure availability of appropriate personal protection equipment such as safety helmets, safety shoes, gloves, life saving equipment nose guard, earplugs, safety harness, goggles to their employees / workers etc., and ensure wearing of PPEs by their employees/workers etc., while carrying out the works.

h) The contractor shall ensure that all their construction plant and equipment to be employed on the work site is in safe and fully efficient working condition and arrange for carrying out required tests from time to time and submit certificates of such tests carried out according to safety regulations and ensure proper maintenance of the plant and equipment.

i) The contractor shall investigate and report in writing to Engineer-in-Charge/ PMC about accidents if any taking place at site of work including near misses cases and based on reviews take remedial measures and implement the corrective action to ensure safe working conditions at site of work.

j) The contractor shall arrange to provide First–Aid facility at site for immediate treatment.

k) The contractor shall submit daily labour report including supervisors etc., with clearly specifying the names and their age to the SMPK's Engineer or his authorized representative at site. Also record of labour working beyond working hours shall be maintained and submitted to the SMPK Engineer or his authorized representative at site.

l) The contractor shall submit the risk assessment on HIRA Format prior to the Execution of each activity.

Traffic/Services Diversion Conditions:

111. Barricades, vigils, safety lamps, flags, signals, caution boards, etc., for temporary traffic diversion etc., as per standards required during execution and progress of the Work without causing any inconvenience to the traffic shall be provided by the contractor at his own cost and all the safety precautions shall be ensured.

112. The Contractor shall take up all diversion works at his own cost.

113. The contractor has to plan well in advance at his own cost for the diversion of traffic keeping in view of existing pipelines, electrical lines, cable network, etc., before commencement of work and necessary precautionary measures has to be taken care.

114. The contractor has to plan and arrange to install at his own cost for re-alignment and erection of removed/diverted pipelines, electrical lines, cable network, etc., before completion of work, as per the requirement and as directed by the Engineer-in-Charge/ PMC.

115. The approaches to the Bridge on either end has to be developed and made good by the contractor at his own cost after completion of the Deck Structure, for safety and smooth flow of traffic as required at site and as directed by the Engineer-in-Charge/ PMC.

Dismantling Conditions:

116. The rate quoted by the bidders should be taken into account for complete dismantling of thebridge deck structure and removal and razing the above up to the top levelof bridge supporting piers and handing over the all useful materials viz., Reinforcement/Structural steel, Steel, pipes, cables, etc., at Port General Stores or as directed by the Engineer-in-Charge/ PMC.

117. All the tenderers are requested to physically inspect the existing sub & super structure including ancillary works of the "Parallel Bridge" in Port area and satisfy themselves about the condition and obtain any clarification if required. No claims will be entertained in this regard.

118. The contractor has to plan well in advance the re-routing of pipelines, electrical lines, cable network, etc., before dismantling of the required work and necessary precautionary measures has to be taken care in the hindrance of the services.

119. The Contractor shall take great care to obtain all the useful materials in good condition from dismantling the structures and transport them to specified stores as directed by the Engineer– in–Charge.

120. The Contractor shall be responsible for the safety of all the useful materials obtained from dismantling until handing over the same to stores as specified or as directed by the Engineer–in–Charge.

121. No work relating dismantling should be undertaken unless and until the contractor /Engineer / Supervisor is present at site and as per the direction of the Engineer-in-Charge/ PMC of the work.

122. The dismantled materials/debris shall be transported and dumped in a place as shown by the Engineer-in-Charge/ PMC as required and as directed by the Engineer-in-Charge/ PMC at his own cost of the bidder.

123. **Dock Permit**: For works inside the Docks, Dock permit required for men , materials, vehicles and equipments etc. are to be procured by the successful tenderer **at free of cost** as per recommendation of the executing departments/divisions indicating the specific number of free permits to be issued. But for creation of individual IDs in permit system a charge as applicable, will be levied per person (one time) even for companies/ Individuals who have been granted permission to obtain free permits by KoPT. In case the work has to be carried out in an operational zone, the tenderer should keep in mind that the work is to be executed without hampering the operational activities and should complete the work within the stipulated time specified in the tender.

SECTION-12

PRICE BID

Syama Prasad Mookerjee Port, Kolkata

CIVIL ENGINEERING DEPARTMENT
१५,स्ट्रैंडरोड,कोलकाता -७००००१
15, Strand Road, Kolkata – 700001

NIT No.: **SMPK/KDS/CIV /T/2622/60 DT. 29.10..2021**

Last Date of **Download** of tender documents
On 09.12.2021 (up to 12:00 hours)
Tender is due for submission by 15:00 hours
On **09.12.2021**

Tender will be opened on 10.12.2021 after 15:00 hours.

PRICE BID

****

"DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S.DOCK, KDS, SMP, KOLKATA"

"**********

Syama Prasad Mookerjee Port, Kolkata

CIVIL ENGINEERING DEPARTMENT

PREAMBLE TO THE BILL OF QUANTITIES

E-TENDER FOR "DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S.DOCK, KDS, SMP, KOLKATA"

NIT NO: SMPK/KDS/CIV /T/2622/60 DT. 29.10.2021

1.1	The Bill of Quantities must be read with the General Conditions of Contract, the Special Conditions of Contract and the Particular Specifications of Work and other documents of Tender and the Bidder is deemed to have examined the above documents and to have thoroughly familiarize himself with the total scope of work and its mode of execution.
1.2	Payment will be made according to the Payment Schedule as mentioned in the Tender Document. The measurements of work shall be measured jointly by the Engineer –In-Charge or his Representative/PMC with the contractor.
1.3	General direction and description of work or materials given elsewhere in the contract documents
1.4	The prices and rates entered by the Contractor in the Bill of Quantities shall be deemed to cover the complete and finished work, inter-alia, all costs and expenses which may be required for successful completion of the works together with all risks, liabilities, contingencies, insurance, octroi, royalties, taxes and obligations imposed or implied by the Contractor.
1.5	Where separate items such mobilization, demobilization, temporary works etc., have not been provided in the Bill of Quantities for works required under the Contract, then the cost of such works shall be deemed to have been included in the prices and rates of other items.
1.6	Without affecting the generality of the foregoing provisions, the prices and rates entered in the Bill of Quantities by the Contractor shall include inter-alia, all costs and expenses involved in or arising out the followings:- a) The provision, storage, transport, handling, use distribution and maintenance of all materials, plans, equipment machineries and tools including all costs, charges, dues, demurrages or other outlays involved in the transportation. b) The provision and maintenance of all his staff and labours and their payments, accommodation, transport, taxes and other requirements. c) Setting out including the location and preservation of survey markers, measurement and supervision. d) The provision, storage, transport, use handling, distribution and maintenance of consumable stores, fuel, water and electricity.

	e) All First Aid, Welfare and safety requirements. f) Damage caused to the works, plants, materials and consumables stores caused by weather. g) Licence, fees and other charges for compliance of Government Acts and Rules that are in-forced and applicable.
1.7	The Contractor should be held responsible for the safe custody of materials, machineries etc. at site procured by him or issued to him by the Trustees.
1.8	This being a Lump- sum amount tender, the Bidder shall quote his rates on the basis of preliminary Design of Project & also considering other incidental charges during the execution of work based detailed analysis of the Project work on his own analysis.
1.9	No prices in figures or in words should me mentioned anywhere in the Techno - Commercial bid
2.0	Formats: Price Bid main format is related to price bid. The format should be entered online.
2.1	Apart from what is indicated in this NIT no other cost will be payable to the contractor. The bidder should therefore read all the instruction in this NIT carefully, visit the site, make preliminary design of the project and considered other incidental cost to ensure that they have quoted completely and fully. No addititional demands would be entertained during the execution of the contract.

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Syama Prasad Mookerjee Port, Kolkata

CIVIL ENGINEERING DEPARTMENT

BILL OF QUANTITIES

E-TENDER "DESIGN, ENGINEERING & CONSTRUCTION FOR REHABILITATION OF 7, NSD OLD BERTH INCLUDING DEVELOPMENT OF BACKYARD AT N.S.DOCK, KDS, SMP, KOLKATA"

SMPK/KDS/CIV /T/2622/60. DT. 29.10.2021

BILL OF QUANTITIES

SL No	Description	Qty	Unit	Rate	Amount (Rs) in figure
1	Rehabilitation and reconstruction of old 7, NSD Berth of size 182.2m x 26.75m after demolition of old berth structure (slab, beam, pile muff and other fitting & fixture) to be construction on in situ boared piles. The berth structure will rest on pile muff with necessary beam-slab combination for operation of MHC of LHM425 & RMQC and development of a container stackyard of size 182.20m x 61.95m with paver block topping after dismantling of old existing yard to withstand load of 5 high 40'/20' container stacking with movement of RST with provision of necessary drainage, RCC cable trench and fire-fighting duct and foundation of high mast electric tower.	1.00	Each		
	TOTAL AMOUNT (In Words)				

NOTE: PRICE NOT TO BE QUOTED HERE

Total Tendered Amount: Rs.

Total tendered amount (in words……)

[The prices quoted shall be including all statutory levies excluding GST, which shall be paid extra]

Maximum number of workmen likely to be engaged in days work…….. numbers

Permanent Income Tax A/C. No… ……..

Date: _____ (Signature of Tenderer)

[Total amount of tender, completion time and preliminary time as quoted / stated above are to be carried over to Form of Tender attached]

_____

(Signature of Tenderer)

Witness: -

(Name in block letters)

Address:

Occupation

SECTION -11

SOIL INVESTIGATION REPORT

SYAMA PRASAD MOOKERJEE PORT KOLKATA

CIVIL ENGINEERING DEPARTMENT
OFFICE OF THE CHIEF ENGINEER
15 STRAND ROAD, KOLKATA – 700001

REPORT
ON

SOIL INVESTIGATION WORK FOR THE UPGRADATION OF BERTH NO.7, NSD, N.S.DOCK

CONSTELL

CONSTELL CONSULTANTS PVT. LTD.
KOLKATA

JOB NUMBER: CCPL/20101211

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CHAPTER – I

1.0 INTRODUCTION

1.1 Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock was entrusted to Constell Consultants Pvt. Ltd., 7, Sristidhar Dutta Lane, Kolkata – 700 006 by Syama Prasad Mookerjee Port, Kolkata, Civil Engineering Department, Office of the Chief Engineer, 15 Strand Road, Kolkata – 700001.

1.2 The scope of the soil investigation work consisted of sinking ten (10) bore holes each upto a depth of 50.0m below the existing ground / bed level in all kinds of soil formation including collection of undisturbed / disturbed soil samples and conducting Standard Penetration Tests.

1.3 The formation at the site is to be reported for various layers present at their respective depths along with their thickness. As ground water table location influences the method of construction of foundation at a site, its depth also needed to be found out. However, it should be noted that the depth of groundwater table observed during the investigation could differ from those encountered during construction and operational life of the constructed facility depending on prevailing meteorological conditions.

1.4 During sinking of bore holes soil samples both in disturbed and undisturbed conditions are to be collected for laboratory tests. The disturbed samples would be subjected to tests to obtain soil index properties. The undisturbed soil samples, however, would be used mainly for conducting tests to obtain shear strength parameters as well as compressibility characteristics of the soil representing the strata.

1.5 Since the investigation could not cover the regional sub-soil features, due weightage for the variations of sub-surface layers in its horizontal and vertical extent is to be given in selecting design basis.

C H A P T E R – I I

2.0 PROJECT DETAILS

2.1 The site for the investigation work is situated inside N.S. Dock at Berth No.7 in Kolkata.

2.2 The field work consisted of sinking ten (10) bore holes – four (4) from the existing bed level below the concrete deck of Berth No.7 and six (6) on the adjacent land each upto a depth of 50.00m below the existing ground / bed level at specified locations. The details of field work like, location (Co-ordinate), bore hole no., RL at bore hole top, termination depth, water level and the dates of commencement and completion are furnished below.

Bore Hole No.	Location (Co-ordinate)		RL. at Bore Hole Top	Termina -tion Depth	Water Level b.g.l	Start Date	End Date
	North	*East*	*(m)*	*(m)*	*(m)*		
BH-1	22°32'29.50"	88°17'58.75"	+4.4	50.00	** Under Water	27.11.20	30.11.20
BH-2	22°32'28.20"	88°17'58.70"	+4.4	50.00		13.11.20	16.11.20
BH-3	22°32'27.17"	88°17'57.86"	+4.3	50.00		10.12.20	12.12.20
BH-4	22°32'25.75"	88°17'57.89"	+4.3	50.00		23.11.20	26.11.20
BH-5	22°32'24.68"	88°17'57.17"	+7.3	50.00	2.00	03.12.20	05.12.20
BH-6	22°32'29.05"	88°18'0.23"	+7.3	50.00	2.10	30.11.20	02.12.20
BH-7	22°32'27.06"	88°17'59.80"	+7.3	50.00	2.05	13.12.20	15.12.20
BH-8	22°32'25.69"	88°17'58.97"	+7.3	50.00	2.20	07.12.20	09.12.20
BH-10	22°32'28.88"	88°18'1.53"	+7.3	50.00	2.10	17.11.20	20.11.20
BH-11	22°32'27.63"	88°18'1.01"	+7.3	50.00	2.05	21.11.20	23.11.20
Note: b.g.l.= below ground level, ** = max. and min. water level are shown in respective borelogs							

2.3 The bore holes of 150 mm diameter were explored with the help of cable operated shell using engine driven mechanical winch as per IS 1892-1979. Shell is used which is a 127mm diameter steel cylinder with a cutting edge at the bottom and is fitted with a hinged one-way flap valve at the bottom. The bore hole is advanced by raising the shell upto a height and allowing it to fall and this is repeated several times till sufficient amount

of soil enters the shell. When the shell gets nearly filled with soil, it is lifted out of the bore hole and emptied. This method of boring is followed upto a suitable depth below the existing ground / bed level.

For further advancement of bore hole mud rotary boring method was adopted. In this method the boring is advanced by a cutter fixed to drill pipes, which are rotated by means of pipe wrenches. Bentonite solution is pushed simultaneously by a mechanical pump. The slurry flowing out of cutter bottom mixes up with the cut soil and flows up to the ground surface, and slurry tank after passing through settling pits and back to the slurry tank. The process is continuous and the same slurry can be used several times. The cutting tool is lowered slowly with the help of a double pulley system fixed on a tripod. This method of boring was followed upto the explored depth of the bore hole.

2.4 Seamless flush jointed steel casing of Sx size was used to prevent any caving and water loss from bore holes and those were inserted simultaneously with the advancement of boring operations.

2.5 The undisturbed samples were collected from the bore holes at suitable interval wherever possible, with the help of a thin walled sampler, as per the IS: 2132-1986 “Code of practice for thin walled tube sampling of soils”. The area ratio of the sampler is of the order of twelve percent and the inside clearance is around two percent. The sample tube about 500mm long and 100mm inner diameter, is coupled with the sampler with a drive head, vent holes and ball check valve to complete the sampling assembly. While sampling below the water table inside the bore hole, the entrapped water has the opportunity to escape through this valve at the top. The sampling assembly is then lowered inside the bore holes by connecting a string of ‘AW’ size drill rods to it. The assembly is driven to a predetermined depth with the help of jarring link. On completion of sampling operation, the sampler is first rotated (so that the soil would shear off on a horizonal plane at the cutting

shoe edge) and then raised to the surface. The undisturbed sample is waxed at both ends with proper identification mark on the tube sampler.

2.6 Standard Penetration Tests were conducted inside the bore holes at 1.5m intervals as per IS 2131-1981 “Method of standard penetration tests for soils”. The spoon is advanced by driving with a **Auto-Trip** hammer weighing 63.5 kg falling freely through a height of 75 cm. A record of the number of blows required to penetrate every 15 cm. to a depth of 45cm is kept. The number of blows required for the last 30 cm penetration of the split spoon sampler is recorded as ‘N’-value. On completion of the test, the sampler is lifted to the ground, opened and the specimen of the soil sample is stored in double polythene bags with the proper identification mark. The penetration number, ‘N’ has been shown against the corresponding depths in field bore logs

2.7 Representative disturbed samples were collected regularly and wherever the stratum changed. These samples are taken from the cutting edge of undisturbed samples and the split spoon samplers after standard penetration tests. These samples are labelled depth wise and used in the preparation of bore hole log and for general identification and classification purposes. Moreover large quantity of disturbed samples from bailer cuttings (10 nos.) were collected from different depths of BH-5 to BH-8, BH-10 and BH-11 for the determination of maximum dry density and optimum moisture content by light and heavey compactions as specified.

2.8 The field investigation work commenced on 13.11.2020 and was completed on 15.12.2020.

CHAPTER – III

3.0 LABORATORY TESTING

3.1 The following laboratory tests are carried out on undisturbed and disturbed soil samples for identification and classification purposes and to obtain other relevant properties of the sub-surface formation.

(a) Natural Moisture Content

(b) Sieve analysis

(c) Hydrometer analysis

(d) Liquid Limit and Plastic Limit

(e) Bulk and Dry Density

(f) Unconfined Compression Test

i) On Undisturbed sample

ii) On Remoulded sample

(g) Triaxial Shear Test (Unconsolidated Un-drained)

(h) Direct shear test

i) On Undisturbed sample

ii) On Remoulded sample

(i) Specific Gravity

(j) Consolidation Test

(k) Permeability Test

(l) Proctor Test (Light and Heavy Compaction)

3.2 Chemical analysis of soil samples were also carried out for the determination of different parameters as specified.

3.3 All these tests are conducted as per relevant IS Code where such exists and the test results are tabulated in Tables attached herewith.

C H A P T E R - I V

4.0 DISCUSSION AND RECOMMENDATION

4.1 The sub-soil investigation work has been investigated by sinking ten (10) bore holes each upto a depth of 50.0m below the existing ground / bed level at specified locations. The field investigation data and the results of laboratory test conducted on samples collected from the bore holes indicate the presence of different layers beside a filled up layer at the surface of BH-5 to 8, BH-10 & BH-11. The details of layers like layer no., description of layer and the thickness of each layer as encountered in the bore holes are furnished below.

Layer No.	Description	Layer Thickness (m)				
		BH-1	BH-2	BH-3	BH-4	BH-5
—	Fill consisting of silty sand / sand with stone / brick pieces etc.	–	–	–	–	0.70
I	Soft / firm silty clay / silty clay with high silt content / sandy silty clay	5.00	*5.00	–	3.50	*4.80
II	Very soft / soft / firm silty clay / clayey silt with varying percentage of decomposed wood	6.00	6.00	13.00	7.50	9.50
IIIA	Stiff / very stiff silty clay with occasional traces of calcareous nodules	6.50	4.00	5.00	5.00	4.50
IIIB	Stiff / very stiff / hard silty clay (high silt content) / clayey silt / sandy silty clay / medium dense clayey sandy silt	4.50	3.00	4.50	1.50	3.50
IV	Medium dense / dense / very dense silty sand	3.00	7.50	2.50	7.50	5.00
V	Stiff / very stiff to hard silty clay / sandy silty clay with occasional yellow / brown spots	11.50	12.50	12.50	10.80	11.00
VI	Medium dense / dense / very dense silty sand / medium to fine sand	13.50	12.00	12.50	14.20	**11.00

*1.75m±0.25m thick bands of very loose / loose silty fine sand / fine sand are found to be present at the top and within layer-I in BH-2 and BH-5 as shown in sub-soil profile.
**1.5m thick band of hard sandy silty clay is found to be present in layer-VI from 44.0m to 45.5m depth in BH-5 as shown in sub-soil profile.

Layer No.	Description	Layer Thickness (m)				
		BH-6	BH-7	BH-8	BH-10	BH-11
—	Fill consisting of silty sand / sand with stone / brick pieces etc.	2.00	1.50	0.90	1.50	0.80
I	Soft / firm silty clay / silty clay with high silt content / sandy silty clay	*4.50	4.00	*4.60	5.00	6.70
II	Very soft / soft / firm silty clay / clayey silt with varying percentage of decomposed wood	9.00	9.50	9.50	7.50	7.00
IIIA	Stiff / very stiff silty clay with occasional traces of calcareous nodules	4.50	6.00	7.50	5.50	3.50
IIIB	Stiff / very stiff / hard silty clay (high silt content) / clayey silt / sandy silty clay / medium dense clayey sandy silt	4.50	4.50	3.00	2.50	4.50
IV	Medium dense / dense / very dense silty sand	2.50	2.50	2.50	5.00	4.50
V	Stiff / very stiff to hard silty clay / sandy silty clay with occasional yellow / brown spots	12.50	12.50	11.30	18.00	18.00
VI	Medium dense / dense / very dense silty sand / medium to fine sand	**10.50	9.50	10.70	5.00	5.00

*1.5m thick band of loose / medium dense sandy silt / silty sand with traces of clay are found to be present at the top and within layer-I in BH-6 and BH-8 as shown in sub-soil profile.
**1.5m thick band of hard sandy silty clay is found to be present in layer-VI from 44.0m to 45.5m depth BH-6 as shown in sub-soil profile.

Note: The description of layers are very much generalized. For detail description refer respective bore hole logs.

4.2 The water level in the bore holes during the period of field work are shown in the respective bore logs. The laboratory test results are tabulated in table nos. C/1-1 to C/12-5. The bore hole location plan is shown in fig. no. A/1. The graphical representation of field and corrected 'N' values with RL are shown in fig. nos. B/1 to B/4. The sub-soil formation as revealed by the bore holes are shown in fig. nos. D/1 to D/4. The grain size distribution curves are shown in fig. nos. E/1 to E/78. The Mohr's diagrams from Tri-axial shear test and normal stress vs shear stress plot from Direct Shear Test are shown in fig. nos. F/1 to F/53. The e-log p curves from consolidation test are shown in fig. nos. G/1 to

G/100. The figures of moisture content vs dry density plot both for light and heavy compaction are shown in fig nos. H/1 to H/20.

4.3 On close scrutiny of field and laboratory test results and based on experience and judgement, necessary soil parameters (bore hole wise) for the purpose of design of foundation are tabulated in the following table.

BH-1

LAYER DETAILS					Corrected N Value	Bulk Density (t/m^3)	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	(m)			
I	Soft to firm sandy silty clay to silty clay	+4.4 (B.L.)	(-)0.6	5.0	4 to 5	1.854	c=2.9t/m²
II	Soft / firm silty clay / clayey silt with varying percentage of decomposed wood	(-)0.6	(-)6.6	6.0	2 to 5	1.584	c=1.9t/m²
IIIA	Stiff / very stiff silty clay	(-)6.6	(-)13.1	6.5	10 to 18	1.945	c=7.0t/m²
IIIB	Hard sandy silty clay with occasional presence of gravels	(-)13.1	(-)17.6	4.5	39 & 47	§2.070	§c=19.0t/m²
IV	Dense silty sand	(-)17.6	(-)20.6	3.0	§40	2.050	ϕ=36°
V	Very stiff / hard silty clay with brown spots	(-)20.6	(-)28.1	7.5	19 to 23	1.966	c=9.7t/m²
		(-)28.1	(-)32.1	4.0	32 & 35	§2.030	§c=15.0t/m²
VI	Dense / very dense silty sand	(-)32.1	(-)45.6 (T.L.)	13.5	§40	2.078	ϕ=37.5°
B.L= Bed Level, T.L.= Termination Level, § = Suggested Value							

BH-2

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	**Description**	**R.L (m)**		**Thick-ness**			
		From	**To**	*(m)*			
I	Very loose / loose silty fine sand followed by soft / firm silty clay	+4.4 (B.L.)	+2.4	2.0	4	1.755	ϕ=26°
		+2.4	(-)0.6	3.0	4	1.832	c=2.5t/m²
II	Soft / firm silty clay / clayey silt with varying percentage of decomposed wood	(-)0.6	(-)6.6	6.0	2 to 5	1.595	c=2.1t/m²
IIIA	Stiff to very stiff silty clay	(-)6.6	(-)10.6	4.0	10 to 17	1.946	c=7.0t/m²
IIIB	Stiff / very stiff silty clay with high silt content	(-)10.6	(-)13.6	3.0	17	1.963	c=7.3t/m²
IV	Medium dense silty sand	(-)13.6	(-)21.1	7.5	18 to 29	1.965	ϕ=34°
V	Very stiff to hard silty clay	(-)21.1	(-)25.6	4.5	17 & 23	1.969	c=10.0t/m²
		(-)25.6	(-)33.6	8.0	36 to 52	§2.070	§c=19.0t/m²
VI	Dense / very dense silty sand	(-)33.6	(-)45.6 (T.L.)	12.0	§40	2.065	ϕ=37°
B.L= Bed Level, T.L.= Termination Level, § = Suggested Value							

BH-3

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	**Description**	**R.L (m)**		**Thick-ness**			
		From	**To**	*(m)*			
II	Very soft to soft silty clay with varying percentage of decomposed wood	+4.3 (B.L.)	(-)8.7	13.0	1 to 4	1.626	c=1.6t/m²
IIIA	Stiff silty clay	(-)8.7	(-)13.7	5.0	8 to 16	1.923	c=6.1t/m²
IIIB	Very stiff to hard sandy silty clay	(-)13.7	(-)15.2	1.5	27	§2.000	§c=12.0t/m²
		(-)15.2	(-)18.2	3.0	38 & 47	§2.070	§c=19.0t/m²
IV	Dense / very dense silty sand	(-)18.2	(-)20.7	2.5	37	2.028	ϕ=35.5°
V	Very stiff silty clay	(-)20.7	(-)33.2	12.5	24 to 30	2.001	c=12.2t/m²
VI	Dense / very dense silty sand	(-)33.2	(-)36.2	3.0	§40	2.058	ϕ=37°
		(-)36.2	(-)37.7	1.5	27	2.028	ϕ=35°
		(-)37.7	(-)45.7 (T.L.)	8.0	§40	2.056	ϕ=37°
B.L= Bed Level, T.L.= Termination Level, § = Suggested Value							

BH-4

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	**Description**	**R.L (m)**		**Thick-ness**			
		From	**To**	*(m)*			
I	Firm silty clay to silty clay with high silt content	+4.3 (B.L.)	+0.8	3.5	5 & 6	1.852	c=3.0t/m²
II	Soft silty clay / clayey silt with varying percentage of decomposed wood	+0.8	(-)6.7	7.5	2 to 5	1.544	c=1.9t/m²
IIIA	Stiff to very stiff silty clay	(-)6.7	(-)9.7	3.0	9 & 14	1.920	c=5.6t/m²
		(-)9.7	(-)11.7	2.0	20	1.970	c=9.8t/m²
IIIB	Stiff silty clay with high silt content / clayey silt	(-)11.7	(-)13.2	1.5	15	1.949	c=5.9t/m²
IV	Medium dense to dense silty sand	(-)13.2	(-)17.7	4.5	18 to 25	1.940	ϕ=33°
		(-)17.7	(-)20.7	3.0	32 & 36	2.020	ϕ=36.5°
V	Very stiff to hard silty clay with occasional brown spots	(-)20.7	(-)22.2	1.5	17	1.958	c=7.8t/m²
		(-)22.2	(-)31.5	9.3	28 to 34	§2.020	§c=14.5t/m²
VI	Dense / very dense silty sand	(-)31.5	(-)45.7 (T.L.)	14.2	§40	2.064	ϕ=37°
B.L= Bed Level, T.L.= Termination Level, § = Suggested Value							

BH-5

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of silty sand with stone / brick pieces etc.	+7.3 (G.L.)	+6.6	0.7	–	§1.800	–
I	Firm silty clay to silty clay with high silt content; loose fine sand observed from 2.5m to 4.0m depth	+6.6	+4.8	1.8	4	1.813	c=2.4t/m²
		+4.8	+3.3	1.5	5	1.755	ϕ=27°
		+3.3	+1.8	1.5	4	1.830	c=2.5t/m²
II	Soft to firm silty clay with varying percentage of decomposed wood	+1.8	(-)4.7	6.5	2 to 3	1.649	c=1.9t/m²
		(-)4.7	(-)7.7	3.0	6 & 7	1.755	c=3.1t/m²
IIIA	Stiff silty clay with occasional presence of calcareous nodules	(-)7.7	(-)12.2	4.5	9 & 10	1.934	c=5.2t/m²
IIIB	Very stiff brownish yellow silty clay (high silt content) / clayey silt with sand; medium dense sandy silt observed from 22.5m depth	(-)12.2	(-)15.2	3.0	21 & 25	§1.980	§c=10.0t/m²
		(-)15.2	(-)15.7	0.5	19	§1.910	§ϕ=31°
IV	Medium dense to dense silty sand	(-)15.7	(-)18.2	2.5	23	1.940	ϕ=33°
		(-)18.2	(-)20.7	2.5	34 & 39	2.030	ϕ=36.5°
V	Stiff / very stiff to hard silty clay with occasional brown spots	(-)20.7	(-)24.2	3.5	15 & 18	1.958	c=8.0t/m²
		(-)24.2	(-)27.2	3.0	24 & 29	2.008	c=11.8t/m²
		(-)27.2	(-)31.7	4.5	33 to 36	§2.035	§c=15.5t/m²
VI	Medium dense / dense to very dense silty sand	(-)31.7	(-)34.7	3.0	29	2.026	ϕ=35°
		(-)34.7	(-)40.7	6.0	§40	2.061	ϕ=37°
		(-)40.7	(-)42.7 (T.L.)	2.0	25 & 33	2.021	ϕ=35°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

BH-6

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of silty sand with stone / brick pieces etc.	+7.3 (G.L.)	+5.3	2.0	–	1.830	–
I	Soft to firm silty clay; loose sandy silt / silty sand with clay as binder observed upto 3.5m depth	+5.3	+3.8	1.5	8	1.760	ϕ=27.5°
		+3.8	+2.3	1.5	2	1.801	c=1.4t/m²
		+2.3	+0.8	1.5	6	1.851	c=3.4t/m²
II	Soft / firm silty clay with varying percentage of decomposed wood	+0.8	(-)8.2	9.0	2 to 5	1.666	c=1.8t/m²
IIIA	Stiff silty clay with occasional traces of calcareous nodules	(-)8.2	(-)12.7	4.5	9 to 16	1.935	c=6.4t/m²
IIIB	Medium dense sandy silt with clay as binder to hard silty clay with high silt content	(-)12.7	(-)17.2	4.5	20 & 28	§1.980	§ϕ=33°
IV	Dense silty sand	(-)17.2	(-)19.7	2.5	33 & 37	2.028	ϕ=36°
V	Very stiff to hard silty clay	(-)19.7	(-)26.2	6.5	19 to 23	1.966	c=9.0t/m²
		(-)26.2	(-)29.2	3.0	33 & 35	§2.030	§c=15.0t/m²
		(-)29.2	(-)32.2	3.0	23	§1.970	§c=10.0t/m²
VI	Dense / very dense silty sand	(-)32.2	(-)42.7 (T.L.)	10.5	§40	2.059	ϕ=37.5°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

BH-7

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of silty sand with stone / brick pieces etc.	+7.3 (G.L.)	+5.8	1.5	–	1.855	–
I	Soft silty clay	+5.8	+1.8	4.0	2 to 3	1.764	c=1.7t/m²
II	Soft / firm silty clay with varying percentage of decomposed wood	+1.8	(-)7.7	9.5	3 to 5	1.670	c=2.1t/m²
IIIA	Stiff silty clay	(-)7.7	(-)8.7	1.0	9	§1.890	§c=4.0t/m²
		(-)8.7	(-)13.7	5.0	12 to 17	1.948	c=7.2t/m²
IIIB	Stiff to very stiff silty clay with high silt content	(-)13.7	(-)15.2	1.5	15	§1.950	§c=6.5t/m²
		(-)15.2	(-)18.2	3.0	25 & 31	§2.010	§c=12.5t/m²
IV	Medium dense to very dense silty sand	(-)18.2	(-)19.7	1.5	28	2.019	ϕ=35°
		(-)19.7	(-)20.7	1.0	§40	§2.070	§ϕ=37°
V	Very stiff to hard silty clay with occasional brown / yellow spots	(-)20.7	(-)27.2	6.5	17 to 24	1.964	c=9.0t/m²
		(-)27.2	(-)31.7	4.5	35 to 42	§2.050	§c=17.0t/m²
		(-)31.7	(-)33.2	1.5	24	§1.980	§c=11.0t/m²
VI	Dense / very dense fine sand	(-)33.2	(-)42.7 (T.L.)	9.5	§40	2.055	ϕ=37°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

BH-8

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of silty sand with stone / brick pieces etc.	+7.3 (G.L.)	+6.4	0.9	–	§1.800	–
I	Firm silty clay; medium dense silty fine sand with traces of clay observed from 2.5m to 4.0m depth	+6.4	+4.8	1.6	6	1.851	c=3.1t/m²
		+4.8	+3.3	1.5	15	1.834	ϕ=31°
		+3.3	+1.8	1.5	4	1.825	c=2.4t/m²
II	Soft / firm silty clay with varying percentage of decomposed wood	+1.8	(-)7.7	9.5	2 to 5	1.637	c=2.0t/m²
IIIA	Stiff silty clay with occasional traces of calcareous nodules	(-)7.7	(-)15.2	7.5	10 to 16	1.935	c=6.0t/m²
IIIB	Medium dense sandy clayey silt to sandy silt with traces of clay	(-)15.2	(-)18.2	3.0	24 & 25	§1.980	§ϕ=33.5°
IV	Medium dense to dense silty sand	(-)18.2	(-)19.7	1.5	19	1.911	ϕ=32.5°
		(-)19.7	(-)20.7	1.0	§40	§2.070	§ϕ=37°
V	Very stiff to hard silty clay with yellow spots	(-)20.7	(-)24.2	3.5	19 & 21	1.962	c=9.2t/m²
		(-)24.2	(-)28.7	4.5	27 to 31	§2.020	§c=13.0t/m²
		(-)28.7	(-)32.0	3.3	38 to 49	§2.070	§c=19.5t/m²
VI	Dense / very dense silty sand	(-)32.0	(-)34.7	2.7	31	2.012	ϕ=36°
		(-)34.7	(-)42.7 (T.L.)	8.0	§40	2.059	ϕ=37.5°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

BH-10

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of silty sand with stone / brick pieces etc.	+7.3 (G.L.)	+5.8	1.5	–	§1.800	–
I	Soft / firm silty clay	+5.8	+3.8	2.0	3	1.801	c=1.7t/m²
		+3.8	+0.8	3.0	5 & 6	1.856	c=2.8t/m²
II	Soft / firm silty clay with varying percentage of decomposed wood	+0.8	(-)4.7	5.5	3 to 4	1.590	c=1.9t/m²
		(-)4.7	(-)6.7	2.0	6	1.448	c=2.7t/m²
IIIA	Stiff silty clay with occasional traces of calcareous nodules	(-)6.7	(-)12.2	5.5	8 to 13	1.930	c=5.2t/m²
IIIB	Very stiff / hard silty clay with high silt content to medium dense clayey sandy silt	(-)12.2	(-)14.2	2.0	31	2.018	§c=14.0t/m²
		(-)14.2	(-)14.7	0.5	20	§1.920	§ϕ=32°
IV	Medium dense silty sand	(-)14.7	(-)19.7	5.0	21 to 22	1.929	ϕ=33°
V	Very stiff to hard silty clay to sandy silty clay	(-)19.7	(-)21.7	2.0	19	1.964	c=8.4t/m²
		(-)21.7	(-)23.2	1.5	27	2.006	c=11.4t/m²
		(-)23.2	(-)37.7	14.5	35 to 45	§2.070	§c=18.0t/m²
VI	Dense / very dense silty sand	(-)37.7	(-)42.7 (T.L.)	5.0	§40	2.069	ϕ=37°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

BH-11

LAYER DETAILS					Corrected N Value	Bulk Density *(t/m³)*	Shear Strength parameter
No.	Description	R.L (m)		Thick-ness			
		From	To	*(m)*			
—	Fill consisting of sand with stone / brick pieces etc.	+7.3 (G.L.)	+6.5	0.8	–	§1.800	–
I	Soft sandy silty clay; very loose to loose clayey sandy silt to silty fine sand observed from 4.5m depth	+6.5	+2.8	3.7	2 & 4	1.821	c=1.8t/m²
		+2.8	(-)0.2	3.0	2 & 7	1.760	ϕ=26°
II	Soft / firm silty clay / clayey silt with varying percentage of decomposed wood	(-)0.2	(-)7.2	7.0	3 & 6	1.643	c=2.3t/m²
IIIA	Stiff silty clay with occasional traces of calcareous nodules	(-)7.2	(-)10.7	3.5	8 & 13	1.914	c=5.3t/m²
IIIB	Very stiff silty clay with high silt content to medium dense clayey sandy silt	(-)10.7	(-)12.2	1.5	17	§1.960	§c=7.5t/m²
		(-)12.2	(-)15.2	3.0	14 & 22	§1.900	§ϕ=31.5°
IV	Medium dense / dense silty sand	(-)15.2	(-)19.7	4.5	22 to 30	2.021	ϕ=35°
V	Stiff to very stiff / hard silty clay to sandy silty clay	(-)19.7	(-)21.2	1.5	13	1.936	c=6.1t/m²
		(-)21.2	(-)25.7	4.5	19 to 21	1.967	c=9.5t/m²
		(-)25.7	(-)33.2	7.5	32 to 44	§2.040	§c=16.0t/m²
		(-)33.2	(-)37.7	4.5	§50	§2.080	§c=22.0t/m²
VI	Dense / very dense silty sand	(-)37.7	(-)42.7 (T.L.)	5.0	§40	2.046	ϕ=37°
G.L= Ground Level, T.L.= Termination Level, § = Suggested Value							

4.4 In view of the sub-soil formation encountered in this area, deep foundation in the form of bored cast-in-situ concrete piles may be provided to carry the load from superstructure. The suggested safe load carrying capacities of **1.2m dia. piles** when placed at R.L.(-)23.0m are furnished in the following table.

Bore Hole Nos.	Dredge Level	Pile Details					Suggested Pile capacity		
		Cut-off level	Founding level	Length of pile	Embedded length of pile	Dia.	Vertical	Uplift	Lateral
	(m)	(m)	(m)	(m)	(m)	(m)	(t)	(t)	(t)
BH-1 to BH-5	(-)5.2	+6.0	(-)23.0	29.0	17.8	1.20	125.0	100.0	8.5
BH-6 to BH-8, BH-10 & BH-11	-	+6.0	(-)23.0	29.0	-	1.20	150.0	120.0	12.0

The above mentioned pile capacities have been calculated on the basis of available and conventional static formula using a factor of safety of 2.5. However it is essential to install the piles with good engineering practice. In reality the actual pile load capacity is dependant on proper installation of pile. The piles may be installed at a centre to centre spacing of 3.0 x d, where 'd' is the diameter of a pile. Initial load test on piles should be carried out as per BIS 2911 (Part-4) and based on pile load test data final safe design load on a pile should be adopted.

4.5 The results of chemical analysis of soil samples are tabulated in Table nos. C/12-1 to C/12-5. Based on the results concrete to be used in foundation construction should be in line with recommendations of IS:456 – 2000.

for **CONSTELL CONSULTANTS PRIVATE LIMITED**

Dated January 18, 2021

S.NANDI
B-TECH, ME, MIGS
SR. GEOTECHNICAL ENGINEER

B. N. BASAK
M.E., MIE, MIGS, MIRC, MISEG
DIRECTOR

CHAPTER-V

CONSTELL
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Details of Bore Holes

Sl.	BH No.	Latitude(N)	Longitude(E)	RL
1	BH-1	22°32'29.50"	88°17'58.75"	+4.4
2	BH-2	22°32'28.20"	88°17'58.70"	+4.4
3	BH-3	22°32'27.17"	88°17'57.86"	+4.3
4	BH-4	22°32'25.75"	88°17'57.89"	+4.3
5	BH-5	22°32'24.68"	88°17'57.17"	+7.3
6	BH-6	22°32'29.05"	88°18'0.23"	+7.3
7	BH-7	22°32'27.06"	88°17'59.80"	+7.3
8	BH-8	22°32'25.69"	88°17'58.97"	+7.3
9	BH-10	22°32'28.88"	88°18'1.53"	+7.3
10	BH-11	22°32'27.63"	88°18'1.01"	+7.3

Notes :-

1. All dimensions are in metre, unless otherwise mentioned.
2. Location (co-ordinate) of Bore Holes are supplied by the client.
3. Reduced Level of Bore Holes are based on present berth level whose value is +7.32m above KODS as supplied by the client

Bore Hole Location Plan for the upgradation of Berth No.7, NSD, N.S. Dock

Job No.: CCPL/20101211	Scale : 1: 2000	Figure No.: A/1

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-1

Location : N 22°32'29.50" , E 88°17'58.75"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.85m a.b.l (max.) at 13:00 hrs on 28/11/20
0.65m a.b.l (min.) at 8.00 hrs on 27/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 27.11.20 To 30.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
27/11	+4.4	0.00													Soft to firm grey sandy silty clay to silty clay
		0.50	1.00	0.50	U	-	-	-	-	-	-	-	-	-	
		1.00	1.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		2.00	2.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.50	2.95	0.45	P-D	1	2	3	-	5	-	-	-	-	
		3.50	4.00	0.50	U	-	-	-	-	-	-	-	-	-	
		4.00	4.45	0.45	P-D	1	2	3	-	5	-	-	-	-	
	(-)0.6	5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	5.00m
		5.50	5.95	0.45	P-D	1	2	3	-	5	-	-	-	-	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood
		6.50	7.00	0.50	U	-	-	-	-	-	-	-	-	-	
		7.00	7.45	0.45	P-D	0	1	1	-	2	-	-	-	-	
		8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.50	8.95	0.45	P-D	1	2	3	-	5	-	-	-	-	
		9.50	10.00	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-1

Location : N 22°32'29.50" , E 88°17'58.75"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.85m a.b.l (max.) at 13:00 hrs on 28/11/20
0.65m a.b.l (min.) at 8.00 hrs on 27/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 27.11.20 To 30.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.45	0.45	P-D	1	2	2	-	4	-	-	-	-	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood
	(-)6.6	11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	11.00m
		11.50	11.95	0.45	P-D	3	4	6	-	10	-	-	-	-	Stiff / very stiff bluish grey to greyish yellow silty clay
		13.00	13.45	0.45	P-D	5	7	10	-	17	-	-	-	-	
		14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-	
		14.50	14.95	0.45	P-D	6	7	11	-	18	-	-	-	-	
		16.00	16.45	0.45	P-D	5	7	7	-	14	-	-	-	-	
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-	
29/11	(-)13.1	17.50	17.56	0.06	P-D	80 (6.0cm)	-	-	-	>100	-	-	-	-	17.50m
		19.00	19.45	0.45	P-D	16	19	20	-	39	-	-	-	-	Hard greyish yellow sandy silty clay with occasional presence of gravels
		20.50	20.95	0.45	P-D	11	20	27	-	47	-	-	-	-	
	(-)17.6	22.00	22.45	0.45	P-D	21	42	53	-	95	-	-	-	-	22.00m
		23.50	23.95	0.45	P-D	18	37	46	-	83	-	-	-	-	Dense yellowish grey silty sand
	(-)20.6	25.00	25.45	0.45	P-D	5	7	13	-	20	-	-	-	-	25.00m Very stiff / hard bluish to brownish grey silty clay with brown spots

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-1

Location : N 22°32'29.50" , E 88°17'58.75"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.85m a.b.l (max.) at 13:00 hrs on 28/11/20
0.65m a.b.l (min.) at 8.00 hrs on 27/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 27.11.20 To 30.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		26.00	26.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff / hard bluish to brownish grey silty clay with brown spots
		26.50	26.95	0.45	P-D	7	9	11	-	20	-	-	-	-	
		28.00	28.45	0.45	P-D	6	8	11	-	19	-	-	-	-	
		29.00	29.50	0.50	U	-	-	-	-	-	-	-	-	-	
		29.50	29.95	0.45	P-D	7	9	12	-	21	-	-	-	-	
		31.00	31.45	0.45	P-D	7	10	13	-	23	-	-	-	-	
		32.50	32.95	0.45	P-D	10	15	17	-	32	-	-	-	-	
		34.00	34.45	0.45	P-D	11	17	18	-	35	-	-	-	-	
		35.50	35.95	0.45	P-D	7	8	13	-	21	-	-	-	-	
	(-)32.1														36.50m
		37.00	37.32	0.32	P-D	44	70	30 (2cm)	-	>100	-	-	-	-	Dense / very dense brownish to greyish yellow silty sand; medium dense brownish grey silty clayey sand observed at 38.5m and 48.0m depth
		38.50	38.95	0.45	P-D	7	9	12	-	21	-	-	-	-	
30/11		40.00	40.34	0.34	P-D	29	68	32 (4cm)	-	>100	-	-	-	-	
		41.50	41.82	0.32	P-D	32	71	25 (2cm)	-	>100	-	-	-	-	
		43.00	43.31	0.31	P-D	35	82	20 (1cm)	-	>100	-	-	-	-	

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-1

Location : N 22°32'29.50" , E 88°17'58.75"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.85m a.b.l (max.) at 13:00 hrs on 28/11/20
0.65m a.b.l (min.) at 8.00 hrs on 27/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 27.11.20 To 30.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		44.50	44.74	0.24	P-D	55	60 (9cm)	-	-	>100	-	-	-	-	Dense / very dense brownish to greyish yellow silty sand; medium dense brownish grey silty clayey sand observed at 38.5m and 48.0m depth
		46.00	46.27	0.27	P-D	60	70 (12cm)	-	-	>100	-	-	-	-	
		48.00	48.45	0.45	P-D	20	26	42	-	68	-	-	-	-	
		50.00	50.36	0.36	P-D	47	52 (6cm)	40	-	>100	-	-	-	-	
	(-)45.6	50.00 (Termination Depth)													

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-2

Location : N 22°32'28.20" , E 88°17'58.70"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.95m a.b.l (max.) at 14:40 hrs on 16/11/20
0.48m a.b.l (min.) at 7.00 hrs on 14/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 13.11.20 To 16.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
13/11	+4.4	0.00	0.50	0.50	U		-	-	-	-					Very loose / loose yellowish grey silty fine sand
		0.50	0.95	0.45	P-D	1	1	1	-	2	-	-	-	-	
	+2.4	2.00	2.45	0.45	P-D	2	2	2	-	4	-	-	-	-	2.00m
															Soft / firm grey silty clay
		3.00	3.50	0.50	U		-	-	-	-					
		3.50	3.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
	(-)0.6	5.00	5.45	0.45	P-D	2	2	3	-	5	-	-	-	-	5.00m
															Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 9.0m depth
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
		6.50	6.95	0.45	P-D	1	1	2	-	3	-	-	-	-	
		8.00	8.45	0.45	P-D	1	1	1	-	2	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
		9.50	9.95	0.45	P-D	1	2	3	-	5	-	-	-	-	
	(-)6.6	11.00	11.45	0.45	P-D	3	5	5	-	10	-	-	-	-	11.00m
															Stiff to very stiff bluish grey silty clay
		12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.50	12.95	0.45	P-D	4	8	9	-	17	-	-	-	-	

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-2

Location : N 22°32'28.20" , E 88°17'58.70"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.95m a.b.l (max.) at 14:40 hrs on 16/11/20
0.48m a.b.l (min.) at 7.00 hrs on 14/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 13.11.20 To 16.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		14.00	14.45	0.45	P-D	5	8	8	-	16	-	-	-	-	Stiff to very stiff bluish grey silty clay
	(-)10.6	15.00	15.50	0.50	U	-	-	-	-	-	-	-	-	-	15.00m
14/11		15.50	15.95	0.45	P-D	8	8	9	-	17	-	-	-	-	Stiff / very stiff greyish yellow silty clay with high silt content
		17.00	17.45	0.45	P-D	5	6	11	-	17	-	-	-	-	
	(-)13.6	18.00	18.50	0.50	U	Slipped				-	-	-	-	-	18.00m
		18.50	18.95	0.45	P-D	12	20	28	-	48	-	-	-	-	Medium dense greyish yellow silty sand; hard yellowish grey silty clay with kankars observed at 21.5m depth
		20.00	20.45	0.45	P-D	10	11	13	-	24	-	-	-	-	
		21.50	21.95	0.45	P-D	8	16	20	-	36	-	-	-	-	
		23.00	23.45	0.45	P-D	16	26	41	-	67	-	-	-	-	
		24.50	24.95	0.45	P-D	10	12	17	-	29	-	-	-	-	
	(-)21.1	25.50	26.00	0.50	U	-	-	-	-	-	-	-	-	-	25.50m
		26.00	26.45	0.45	P-D	5	8	9	-	17	-	-	-	-	Very stiff to hard bluish grey to brownish yellow silty clay
		27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	
		27.50	27.95	0.45	P-D	7	15	17	-	32	-	-	-	-	

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-2

Location : N 22°32'28.20" , E 88°17'58.70"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.95m a.b.l (max.) at 14:40 hrs on 16/11/20
0.48m a.b.l (min.) at 7.00 hrs on 14/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 13.11.20 To 16.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		29.00	29.45	0.45	P-D	6	9	14	-	23	-	-	-	-	Very stiff to hard bluish grey to brownish yellow silty clay
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-	
15/11		30.50	30.95	0.45	P-D	13	16	20	-	36	-	-	-	-	
		32.00	32.45	0.45	P-D	12	17	23	-	40	-	-	-	-	
		33.50	33.95	0.45	P-D	16	17	23	-	40	-	-	-	-	
		35.00	35.45	0.45	P-D	17	22	30	-	52	-	-	-	-	
		36.50	36.95	0.45	P-D	11	15	82	-	97	-	-	-	-	
	(-)33.6	38.00	38.23	0.23	P-D	47	75 (8cm)	-	-	>100	-	-	-	-	38.00m
		39.50	39.81	0.31	P-D	34	82	32 (1cm)	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
16/11		41.00	41.45	0.45	P-D	28	50	55	-	105	-	-	-	-	
		42.50	42.74	0.24	P-D	48	61 (9cm)	-	-	>100	-	-	-	-	
		44.00	44.23	0.23	P-D	39	72 (8cm)	-	-	>100	-	-	-	-	
		45.50	45.81	0.31	P-D	32	87	25 (1cm)	-	>100	-	-	-	-	
		47.00	47.16	0.16	P-D	83	32 (1cm)	-	-	>100	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-2

Location : N 22°32'28.20" , E 88°17'58.70"

Ground Elevation : +4.4m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.95m a.b.l (max.) at 14:40 hrs on 16/11/20
0.48m a.b.l (min.) at 7.00 hrs on 14/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.50m

Date : From 13.11.20 To 16.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		48.50	48.83	0.33	P-D	24	76	35 (3cm)	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
		50.00	50.24	0.24	P-D	57	60 (9cm)	-	-	>100	-	-	-	-	
	(-)45.6	50.00 (Termination Depth)													

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-3

Location : N 22°32'27.17" , E 88°17'57.86"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.65m a.b.l (max.) at 10:15 hrs on 12/12/20
0.57m a.b.l (min.) at 12.30 hrs on 12/12/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 10.12.20 To 12.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
10/12	+4.3	0.00													Very soft to soft grey silty clay with varying percentage of decomposed wood
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
		1.50	1.95	0.45	P-D	0	0	1	-	1	-	-	-	-	
		2.50	3.00	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P-D	1	1	2	-	3	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.50	4.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
		5.50	6.00	0.50	U	-	-	-	-	-	-	-	-	-	
		6.00	6.45	0.45	P-D	0	1	1	-	2	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.50	7.95	0.45	P-D	0	1	1	-	2	-	-	-	-	
		8.50	9.00	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P-D	0	1	1	-	2	-	-	-	-	
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M.Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-3

Location : N 22°32'27.17" , E 88°17'57.86"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.65m a.b.l (max.) at 10:15 hrs on 12/12/20
0.57m a.b.l (min.) at 12.30 hrs on 12/12/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 10.12.20 To 12.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.50	10.95	0.45	P-D	1	1	2	-	3	-	-	-	-	Very soft to soft grey silty clay with varying percentage of decomposed wood
		12.00	12.45	0.45	P-D	2	3	4	-	7	-	-	-	-	
	(-)8.7	13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	13.00m
		13.50	13.95	0.45	P-D	3	4	4	-	8	-	-	-	-	Stiff bluish grey to brownish yellow silty clay
11/12		15.00	15.45	0.45	P-D	6	7	9	-	16	-	-	-	-	
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-	
		16.50	16.95	0.45	P-D	4	5	6	-	11	-	-	-	-	
	(-)13.7	18.00	18.45	0.45	P-D	10	12	15	-	27	-	-	-	-	18.00m
		19.50	19.95	0.45	P-D	10	20	27	-	47	-	-	-	-	Very stiff to hard brownish yellow sandy silty clay
		21.00	21.45	0.45	P-D	13	17	21	-	38	-	-	-	-	
	(-)18.2	22.50	22.95	0.45	P-D	23	32	40	-	72	-	-	-	-	22.50m
		24.00	24.30	0.30	P-D	40	74	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
	(-)20.7	25.00	25.50	0.50	U	-	-	-	-	-	-	-	-	-	25.00m
		25.50	25.95	0.45	P-D	8	11	13	-	24	-	-	-	-	Very stiff bluish to brownish grey silty clay

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M.Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-3

Location : N 22°32'27.17" , E 88°17'57.86"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.65m a.b.l (max.) at 10:15 hrs on 12/12/20
0.57m a.b.l (min.) at 12.30 hrs on 12/12/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 10.12.20 To 12.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		27.00	27.45	0.45	P-D	9	12	15	-	27	-	-	-	-	Very stiff bluish to brownish grey silty clay
		28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	
		28.50	28.95	0.45	P-D	12	14	16	-	30	-	-	-	-	
		30.00	30.45	0.45	P-D	11	12	14	-	26	-	-	-	-	
		31.50	31.95	0.45	P-D	14	18	20	-	38	-	-	-	-	
12/12		33.00	33.45	0.45	P-D	10	12	16	-	28	-	-	-	-	
		34.50	34.95	0.45	P-D	9	12	15	-	27	-	-	-	-	
		36.00	36.45	0.45	P-D	10	13	17	-	30	-	-	-	-	
	(-)33.2	37.50	37.80	0.30	P-D	32	70	-	-	>100	-	-	-	-	37.50m
		39.00	39.25	0.25	P-D	58	45 (10cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand; hard greyish brown sandy silty clay observed at 43.5m depth
		40.50	40.95	0.45	P-D	27	32	35	-	67	-	-	-	-	
		42.00	42.27	0.27	P-D	54	67 (12cm)	-	-	>100	-	-	-	-	
		43.50	43.95	0.45	P-D	13	17	45	-	62	-	-	-	-	
		45.00	45.45	0.45	P-D	54	48	59	-	107	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M.Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-3

Location : N 22°32'27.17" , E 88°17'57.86"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.65m a.b.l (max.) at 10:15 hrs on 12/12/20
0.57m a.b.l (min.) at 12.30 hrs on 12/12/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.90m

Date : From 10.12.20 To 12.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		46.50	46.80	0.30	P-D	37	78	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand; hard greyish brown sandy silty clay observed at 43.5m depth
		48.00	48.27	0.27	P-D	43	84 (12cm)	-	-	>100	-	-	-	-	
		50.00	50.25	0.25	P-D	52	58 (10cm)	-	-	>100	-	-	-	-	
	(-)45.7	50.00	(Termination												

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M.Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-4

Location : N 22°32'25.75" , E 88°17'57.89"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.93m a.b.l (max.) at 10:00 hrs on 24/11/20
0.64m a.b.l (min.) at 15.30 hrs on 23/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-14.50m

Date : From 23.11.20 To 26.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
23/11	+4.3	0.00													Firm grey silty clay to silty clay with high silt content
		0.50	1.00	0.50	U	-	-	-	-	-	-	-	-	-	
		1.00	1.45	0.45	P-D	2	3	3	-	6	-	-	-	-	
		2.00	2.50	0.50	U	-	-	-	-	-	-	-	-	-	
		2.50	2.95	0.45	P-D	2	2	3	-	5	-	-	-	-	
	+0.8	3.50	4.00	0.50	U	-	-	-	-	-	-	-	-	-	3.50m
		4.00	4.45	0.45	P-D	2	2	3	-	5	-	-	-	-	Soft grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 3.5m depth
		5.00	5.50	0.50	U	-	-	-	-	-	-	-	-	-	
24/11		5.50	5.95	0.45	P-D	1	1	1	-	2	-	-	-	-	
		6.50	7.00	0.50	U	-	-	-	-	-	-	-	-	-	
		7.00	7.45	0.45	P-D	1	1	1	-	2	-	-	-	-	
		8.00	8.50	0.50	U	-	-	-	-	-	-	-	-	-	
		8.50	8.95	0.45	P-D	1	1	2	-	3	-	-	-	-	
		9.50	10.00	0.50	U	-	-	-	-	-	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-4

Location : N 22°32'25.75" , E 88°17'57.89"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.93m a.b.l (max.) at 10:00 hrs on 24/11/20
0.64m a.b.l (min.) at 15.30 hrs on 23/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-14.50m

Date : From 23.11.20 To 26.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.45	0.45	P-D	2	2	3	-	5	-	-	-	-	Soft grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 3.5m depth
	(-)6.7	11.00	11.50	0.50	U	-	-	-	-	-	-	-	-	-	11.00m
		11.50	11.95	0.45	P-D	3	4	5	-	9	-	-	-	-	Stiff to very stiff bluish grey silty clay
		13.00	13.45	0.45	P-D	3	6	8	-	14	-	-	-	-	
		14.00	14.50	0.50	U	-	-	-	-	-	-	-	-	-	
		14.50	14.95	0.45	P-D	9	9	11	-	20	-	-	-	-	
	(-)11.7	16.00	16.45	0.45	P-D	5	7	8	-	15	-	-	-	-	16.00m
		17.00	17.50	0.50	U	-	-	-	-	-	-	-	-	-	Stiff yellowish grey silty clay with high silt content / clayey silt
	(-)13.2	17.50	17.95	0.45	P-D	5	12	12	-	24	-	-	-	-	17.50m
		19.00	19.45	0.45	P-D	12	18	22	-	40	-	-	-	-	Medium dense to dense yellowish grey silty sand
		20.50	20.95	0.45	P-D	10	18	19	-	37	-	-	-	-	
25/11		22.00	22.45	0.45	P-D	22	34	36	-	70	-	-	-	-	
		23.50	23.95	0.45	P-D	18	29	34	-	63	-	-	-	-	
	(-)20.7	25.00	25.45	0.45	P-D	6	8	9	-	17	-	-	-	-	25.00m Very stiff to hard bluish to brownish grey silty clay with occasional brown spots

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-4

Location : N 22°32'25.75" , E 88°17'57.89"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.93m a.b.l (max.) at 10:00 hrs on 24/11/20
0.64m a.b.l (min.) at 15.30 hrs on 23/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-14.50m

Date : From 23.11.20 To 26.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		26.00	26.50	0.50	U	-	-	-	-	-	-	-	-	-	Very stiff to hard bluish to brownish grey silty clay with occasional brown spots
		26.50	26.95	0.45	P-D	6	12	17	-	29	-	-	-	-	
		28.00	28.45	0.45	P-D	8	15	17	-	32	-	-	-	-	
		29.50	29.95	0.45	P-D	7	12	16	-	28	-	-	-	-	
		31.00	31.45	0.45	P-D	10	16	18	-	34	-	-	-	-	
		32.50	32.95	0.45	P-D	10	15	19	-	34	-	-	-	-	
		34.00	34.45	0.45	P-D	9	14	18	-	32	-	-	-	-	
		35.50	35.95	0.45	P-D	8	21	84	-	105	-	-	-	-	
	(-)31.5														35.80m
		37.00	37.22	0.22	P-D	51	50 (7cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
		38.50	38.75	0.25	P-D	29	80 (10cm)	-	-	>100	-	-	-	-	
26/11		40.00	40.28	0.28	P-D	40	100 (13cm)	-	-	>100	-	-	-	-	
		41.50	41.82	0.32	P-D	25	60	30 (2cm)	-	>100	-	-	-	-	
		43.00	43.30	0.30	P-D	32	82	-	-	>100	-	-	-	-	
		44.50	44.80	0.30	P-D	28	92	-	-	>100	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-4

Location : N 22°32'25.75" , E 88°17'57.89"

Ground Elevation : +4.3m

Method of Boring / Drilling : Shell / Rotary

Water Level : 0.93m a.b.l (max.) at 10:00 hrs on 24/11/20
0.64m a.b.l (min.) at 15.30 hrs on 23/11/20

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-14.50m

Date : From 23.11.20 To 26.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		46.00	46.23	0.23	P-D	35	81 (8cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
		48.00	48.42	0.42	P-D	18	34	80 (12cm)	-	>100	-	-	-	-	
		50.00	50.16	0.16	P-D	73	32 (1cm)	-	-	>100	-	-	-	-	
	(-)45.7	50.00 (Termination Depth)													

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-5

Location : N 22°32'24.68" , E 88°17'57.17"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.00m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 03.12.20 To 05.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
03/12	+7.3	0.00													Fill consisting of grey silty sand with stone / brick pieces etc.
		-	0.50	-	D	-	-	-		-					
	+6.6														0.70m
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay to silty clay with high silt content; loose yellowish grey fine sand observed from 2.5m to 4.0m depth
		1.50	1.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
		2.50	3.00	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.50	4.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
	+1.8	5.50	6.00	0.50	U	-	-	-	-	-	-	-	-	-	5.50m
		6.00	6.45	0.45	P-D	1	1	2	-	3	-	-	-	-	Soft to firm grey silty clay with varying percentage of decomposed wood
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.50	7.95	0.45	P-D	0	1	1	-	2	-	-	-	-	
		8.50	9.00	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P-D	1	1	2	-	3	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-5

Location : N 22°32'24.68" , E 88°17'57.17"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.00m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 03.12.20 To 05.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft to firm grey silty clay with varying percentage of decomposed wood
04/12		10.50	10.95	0.45	P-D	0	1	1	-	2	-	-	-	-	
		12.00	12.45	0.45	P-D	2	3	3	-	6	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	
		13.50	13.95	0.45	P-D	3	3	4	-	7	-	-	-	-	
	(-)7.7	15.00	15.45	0.45	P-D	5	7	10	-	17	-	-	-	-	15.00m
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-	Stiff bluish grey to brownish yellow silty clay with occasional presence of calcareous nodules
		16.50	16.95	0.45	P-D	4	4	5	-	9	-	-	-	-	
		18.00	18.45	0.45	P-D	4	4	6	-	10	-	-	-	-	
	(-)12.2	19.50	19.95	0.45	P-D	6	9	12	-	21	-	-	-	-	19.50m
		21.00	21.45	0.45	P-D	7	10	15	-	25	-	-	-	-	Very stiff brownish yellow silty clay (high silt content) / clayey silt with sand; medium dense sandy silt observed from 22.5m depth
		22.50	22.95	0.45	P-D	9	14	16	-	30	-	-	-	-	
	(-)15.7														23.00m
		24.00	24.45	0.45	P-D	12	19	22	-	41	-	-	-	-	Medium dense to dense yellowish grey silty sand
		25.50	25.95	0.45	P-D	30	36	38	-	74	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-5

Location : N 22°32'24.68" , E 88°17'57.17"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.00m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 03.12.20 To 05.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		27.00	27.45	0.45	P-D	26	42	48	-	90	-	-	-	-	Medium dense to dense yellowish grey silty sand
	(-)20.7														28.00m
		28.50	28.95	0.45	P-D	5	7	8	-	15	-	-	-	-	Stiff / very stiff to hard bluish to yellowish grey silty clay with occasional brown spots
		29.50	30.00	0.50	U	-	-	-	-	-	-	-	-	-	
05/12		30.00	30.45	0.45	P-D	6	8	10	-	18	-	-	-	-	
		31.50	31.95	0.45	P-D	8	11	13	-	24	-	-	-	-	
		32.50	33.00	0.50	U	-	-	-	-	-	-	-	-	-	
		33.00	33.45	0.45	P-D	10	12	17	-	29	-	-	-	-	
		34.50	34.95	0.45	P-D	10	15	18	-	33	-	-	-	-	
		36.00	36.45	0.45	P-D	10	16	20	-	36	-	-	-	-	
		37.50	37.95	0.45	P-D	9	14	19	-	33	-	-	-	-	
	(-)31.7	39.00	39.27	0.27	P-D	24	84 (12cm)	-	-	>100	-	-	-	-	39.00m
		40.50	40.95	0.45	P-D	20	32	45	-	77	-	-	-	-	Medium dense / dense to very dense brownish to greyish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth
		42.00	42.30	0.30	P-D	45	87	-	-	>100	-	-	-	-	
		43.50	43.85	0.35	P-D	38	67	34 (5cm)	-	>100	-	-	-	-	

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-5

Location : N 22°32'24.68" , E 88°17'57.17"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.00m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 03.12.20 To 05.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		45.00	45.45	0.45	P-D	12	14	72	-	86	-	-	-	-	Medium dense / dense to very dense brownish to greyish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth
		46.50	46.80	0.30	P-D	37	88	-	-	>100	-	-	-	-	
		48.00	48.45	0.45	P-D	25	48	54	-	102	-	-	-	-	
		50.00	50.45	0.45	P-D	32	37	35	-	72	-	-	-	-	
	(-)42.7	50.00	(Termination Depth)												

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-6

Location : N 22°32'29.05" , E 88°18'0.23"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 30.11.20 To 02.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
30/11	+7.3	0.00													Fill consisting of brownish grey silty sand with stone / brick pieces etc.
		-	0.50	-	D	-	-	-		-					
		1.50	2.00	0.50	U	-	-	-	-	-	-	-	-	-	
	+5.3	2.00	2.45	0.45	P-D	1	2	4	-	6	-	-	-	-	2.00m
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	Loose grey sandy silt / silty sand with clay as binder
	+3.8	3.50	3.95	0.45	P-D	1	1	1	-	2	-	-	-	-	3.50m
		4.50	5.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft to firm grey silty clay
		5.00	5.45	0.45	P-D	1	3	3	-	6	-	-	-	-	
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
	+0.8	6.50	6.95	0.45	P-D	2	2	2	-	4	-	-	-	-	6.50m
		7.50	8.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.5m depth
		8.00	8.45	0.45	P-D	1	2	3	-	5	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
01/12		9.50	9.95	0.45	P-D	1	1	1	-	2	-	-	-	-	

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-6

Location : N 22°32'29.05" , E 88°18'0.23"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 30.11.20 To 02.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.50	11.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.5m depth
		11.00	11.45	0.45	P-D	0	1	1	-	2	-	-	-	-	
		12.50	12.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
		13.50	14.00	0.50	U	-	-	-	-	-	-	-	-	-	
		14.00	14.45	0.45	P-D	2	3	4	-	7	-	-	-	-	
	(-)8.2	15.50	15.95	0.45	P-D	3	4	5	-	9	-	-	-	-	15.50m
		16.50	17.00	0.50	U	-	-	-	-	-	-	-	-	-	Stiff bluish grey silty clay with occasional traces of calcareous nodules
		17.00	17.45	0.45	P-D	4	6	8	-	14	-	-	-	-	
		18.50	18.95	0.45	P-D	6	8	8	-	16	-	-	-	-	
	(-)12.7	20.00	20.45	0.45	P-D	9	20	30	-	50	-	-	-	-	20.00m
		21.50	21.95	0.45	P-D	14	16	16	-	32	-	-	-	-	Medium dense brownish yellow sandy silt with clay as binder to hard silty clay with high silt content
		23.00	23.45	0.45	P-D	9	18	33	-	51	-	-	-	-	
	(-)17.2	24.50	24.95	0.45	P-D	22	32	36	-	68	-	-	-	-	24.50m
		26.00	26.45	0.45	P-D	20	39	42	-	81	-	-	-	-	Dense yellowish grey silty sand

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-6

Location : N 22°32'29.05" , E 88°18'0.23"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 30.11.20 To 02.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
	(-)19.7	27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	27.00m
		27.50	27.95	0.45	P-D	5	9	10	-	19	-	-	-	-	Very stiff to hard bluish grey silty clay; yellowish grey silty clay with varying percentage of sand observed from 36.5m depth
02/12		29.00	29.45	0.45	P-D	7	8	11	-	19	-	-	-	-	
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-	
		30.50	30.95	0.45	P-D	6	9	12	-	21	-	-	-	-	
		32.00	32.45	0.45	P-D	9	11	12	-	23	-	-	-	-	
		33.50	33.95	0.45	P-D	8	16	22	-	38	-	-	-	-	
		35.00	35.45	0.45	P-D	7	15	20	-	35	-	-	-	-	
		36.50	36.95	0.45	P-D	7	10	13	-	23	-	-	-	-	
		38.00	38.45	0.45	P-D	22	31	34	-	65	-	-	-	-	
	(-)32.2	39.50	39.87	0.37	P-D	16	56	45 (7cm)	-	>100	-	-	-	-	39.50m
		41.00	41.39	0.39	P-D	26	58	42 (9cm)	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth
		42.50	42.78	0.28	P-D	45	84 (13cm)	-	-	>100	-	-	-	-	
		44.00	44.45	0.45	P-D	14	16	31	-	47	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-6

Location : N 22°32'29.05" , E 88°18'0.23"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 30.11.20 To 02.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		45.50	45.76	0.26	P-D	22	81 (11cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth
		47.00	47.28	0.28	P-D	40	73 (13cm)	-	-	>100	-	-	-	-	
		48.50	48.85	0.35	P-D	33	66	34 (5cm)	-	>100	-	-	-	-	
		50.00	50.28	0.28	P-D	36	83 (13cm)	-	-	>100	-	-	-	-	
	(-)42.7	50.00 (Termination Depth)													

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-7

Location : N 22°32'27.06" , E 88°17'59.80"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.50m

Date : From 13.12.20 To 15.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
13/12	+7.3	0.00													Fill consisting of grey silty sand with stone / brick pieces etc.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	
	+5.8	1.50	1.95	0.45	P-D	1	1	2	-	3	-	-	-	-	1.50m Soft grey silty clay
		2.50	3.00	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P-D	0	1	1	-	2	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.50	4.95	0.45	P-D	1	1	1	-	2	-	-	-	-	
	+1.8	5.50	6.00	0.50	U	-	-	-	-	-	-	-	-	-	5.50m Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 5.5m and 13.5m depth
		6.00	6.45	0.45	P-D	2	2	2	-	4	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.50	7.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
		8.50	9.00	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P-D	1	1	2	-	3	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-7

Location : N 22°32'27.06" , E 88°17'59.80"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.50m

Date : From 13.12.20 To 15.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 5.5m and 13.5m depth
		10.50	10.95	0.45	P-D	2	2	3	-	5	-	-	-	-	
		12.00	12.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	
		13.50	13.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
	(-)7.7	15.00	15.45	0.45	P-D	3	4	5	-	9	-	-	-	-	15.00m
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-	Stiff bluish grey to brownish yellow silty clay
		16.50	16.95	0.45	P-D	6	8	9	-	17	-	-	-	-	
		18.00	18.45	0.45	P-D	5	6	9	-	15	-	-	-	-	
		19.50	19.95	0.45	P-D	5	6	6	-	12	-	-	-	-	
14/12	(-)13.7	21.00	21.45	0.45	P-D	4	6	9	-	15	-	-	-	-	21.00m
		22.50	22.95	0.45	P-D	7	10	15	-	25	-	-	-	-	Stiff to very stiff brownish yellow silty clay with high silt content
		24.00	24.45	0.45	P-D	9	13	18	-	31	-	-	-	-	
	(-)18.2	25.50	25.95	0.45	P-D	16	21	34	-	55	-	-	-	-	25.50m Medium dense to very dense brownish yellow silty sand

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-7

Location : N 22°32'27.06" , E 88°17'59.80"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.50m

Date : From 13.12.20 To 15.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		27.00	27.38	0.38	P-D	31	64	40 (8cm)	-	>100	-	-	-	-	Medium dense to very dense brownish yellow silty sand
	(-)20.7	28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	28.00m
		28.50	28.95	0.45	P-D	7	8	10	-	18	-	-	-	-	Very stiff to hard grey to bluish grey silty clay with occasional brown / yellow spots
		30.00	30.45	0.45	P-D	6	7	10	-	17	-	-	-	-	
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-	
		31.50	31.95	0.45	P-D	7	10	11	-	21	-	-	-	-	
		33.00	33.45	0.45	P-D	8	12	12	-	24	-	-	-	-	
		34.50	34.95	0.45	P-D	11	16	19	-	35	-	-	-	-	
		36.00	36.45	0.45	P-D	10	16	20	-	36	-	-	-	-	
		37.50	37.95	0.45	P-D	19	19	23	-	42	-	-	-	-	
		39.00	39.45	0.45	P-D	8	11	13	-	24	-	-	-	-	
	(-)33.2	40.50	40.77	0.27	P-D	42	70 (12cm)	-	-	>100	-	-	-	-	40.50m
		42.00	42.22	0.22	P-D	58	50 (7cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow medium to fine sand
		43.50	43.86	0.36	P-D	40	61	42 (6cm)	-	>100	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-7

Location : N 22°32'27.06" , E 88°17'59.80"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-16.50m

Date : From 13.12.20 To 15.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
15/12		45.00	45.35	0.35	P-D	42	52	40 (5cm)	-	>100	-	-	-	-	Dense / very dense brownish yellow medium to fine sand
		46.50	46.86	0.36	P-D	39	58	42 (6cm)	-	>100	-	-	-	-	
		48.00	48.29	0.29	P-D	47	70 (14cm)	-	-	>100	-	-	-	-	
		50.00	50.27	0.27	P-D	44	67 (12cm)	-	-	>100	-	-	-	-	
	(-)42.7	50.00 (Termination Depth)													

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-8

Location : N 22°32'25.69" , E 88°17'58.97"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 07.12.20 To 09.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
07/12	+7.3	0.00													Fill consisting of yellowish brown silty sand with stone / brick pieces etc.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
	+6.4														0.90m
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	Firm grey silty clay; medium dense grey silty fine sand with traces of clay observed from 2.5m to 4.0m depth
		1.50	1.95	0.45	P-D	1	2	4	-	6	-	-	-	-	
		2.50	3.00	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P-D	4	5	7	-	12	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.50	4.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
	+1.8	5.50	6.00	0.50	U	-	-	-	-	-	-	-	-	-	5.50m
		6.00	6.45	0.45	P-D	1	2	3	-	5	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.0m depth
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
		7.50	7.95	0.45	P-D	1	1	1	-	2	-	-	-	-	
		8.50	9.00	0.50	U	-	-	-	-	-	-	-	-	-	
		9.00	9.45	0.45	P-D	1	1	2	-	3	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-8

Location : N 22°32'25.69" , E 88°17'58.97"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 07.12.20 To 09.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.0m depth
08/12		10.50	10.95	0.45	P-D	0	1	1	-	2	-	-	-	-	
		12.00	12.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		13.00	13.50	0.50	U	-	-	-	-	-	-	-	-	-	
		13.50	13.95	0.45	P-D	1	2	2	-	4	-	-	-	-	
	(-)7.7	15.00	15.45	0.45	P-D	3	4	6	-	10	-	-	-	-	15.00m
		16.00	16.50	0.50	U	-	-	-	-	-	-	-	-	-	Stiff bluish grey to greyish yellow silty clay with occasional traces of calcareous nodules
		16.50	16.95	0.45	P-D	4	5	5	-	10	-	-	-	-	
		18.00	18.45	0.45	P-D	4	5	6	-	11	-	-	-	-	
		19.50	19.95	0.45	P-D	5	7	9	-	16	-	-	-	-	
		21.00	21.45	0.45	P-D	5	7	8	-	15	-	-	-	-	
	(-)15.2	22.50	22.95	0.45	P-D	12	17	25	-	42	-	-	-	-	22.50m
		24.00	24.45	0.45	P-D	17	21	26	-	47	-	-	-	-	Medium dense yellowish grey sandy clayey silt to sandy silt with traces of clay
	(-)18.2	25.50	25.95	0.45	P-D	12	14	16	-	30	-	-	-	-	25.50m Medium dense to dense yellowish grey silty sand

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-8

Location : N 22°32'25.69" , E 88°17'58.97"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 07.12.20 To 09.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		27.00	27.45	0.45	P-D	27	43	55	-	98	-	-	-	-	Medium dense to dense yellowish grey silty sand
	(-)20.7	28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	28.00m
		28.50	28.95	0.45	P-D	8	9	10	-	19	-	-	-	-	Very stiff to hard bluish grey silty clay with yellow spots
		30.00	30.45	0.45	P-D	8	10	11	-	21	-	-	-	-	
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-	
09/12		31.50	31.95	0.45	P-D	10	14	17	-	31	-	-	-	-	
		33.00	33.45	0.45	P-D	10	13	14	-	27	-	-	-	-	
		34.50	34.95	0.45	P-D	9	14	16	-	30	-	-	-	-	
		36.00	36.45	0.45	P-D	14	18	23	-	41	-	-	-	-	
		37.50	37.95	0.45	P-D	12	18	20	-	38	-	-	-	-	
		39.00	39.45	0.45	P-D	12	21	28	-	49	-	-	-	-	
	(-)32.0														39.30m
		40.50	40.95	0.45	P-D	23	36	48	-	84	-	-	-	-	Dense / very dense brownish yellow silty sand
		42.00	42.30	0.30	P-D	38	72	-	-	>100	-	-	-	-	
		43.50	43.77	0.27	P-D	52	68 (12cm)	-	-	>100	-	-	-	-	

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-8

Location : N 22°32'25.69" , E 88°17'58.97"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.20m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.50m

Date : From 07.12.20 To 09.12.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		45.00	45.45	0.45	P-D	30	55	52	-	107	-	-	-	-	Dense / very dense brownish yellow silty sand
		46.50	46.87	0.37	P-D	36	58	43 (7cm)	-	>100	-	-	-	-	
		48.00	48.30	0.30	P-D	42	68	-	-	>100	-	-	-	-	
		50.00	50.30	0.30	P-D	54	72	-	-	>100	-	-	-	-	
	(-)42.7	50.00 (Termination Depth)													

NOTES

1. Abbreviation Used : **U**-Undisturbed Sample **C**-Core Sample **D**-Disturbed Sample **P**-Standard Penetration Test **V**-Vane Shear Test
2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : R.Kr.Biswas | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-10

Location : N 22°32'28.88" , E 88°18'1.53"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.91m

Date : From 17.11.20 To 20.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
17/11	+7.3	0.00													Fill consisting of grey silty sand with stone / brick pieces etc.
		0.30	-	-	D	-	-	-	-	-	-	-	-	-	
	+5.8	1.50	2.00	0.50	U	-	-	-	-	-	-	-	-	-	1.50m
		2.00	2.45	0.45	P-D	1	1	2	-	3	-	-	-	-	Soft / firm grey silty clay; loose grey silty fine sand observed at 3.0m depth
		3.00	3.50	0.50	U	-	-	-	-	-	-	-	-	-	
		3.50	3.95	0.45	P-D	1	3	3	-	6	-	-	-	-	
		4.50	5.00	0.50	U	-	-	-	-	-	-	-	-	-	
		5.00	5.45	0.45	P-D	2	2	3	-	5	-	-	-	-	
		6.00	6.50	0.50	U	-	-	-	-	-	-	-	-	-	
	+0.8	6.50	6.95	0.45	P-D	1	2	2	-	4	-	-	-	-	6.50m
		7.50	8.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed from 12.0m depth
		8.00	8.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		9.00	9.50	0.50	U	-	-	-	-	-	-	-	-	-	
18/11		9.50	9.95	0.45	P-D	1	1	2	-	3	-	-	-	-	

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-10

Location : N 22°32'28.88" , E 88°18'1.53"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.91m

Date : From 17.11.20 To 20.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.50	11.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed from 12.0m depth
		11.00	11.45	0.45	P-D	1	2	2	-	4	-	-	-	-	
		12.00	12.50	0.50	U	-	-	-	-	-	-	-	-	-	
		12.50	12.95	0.45	P-D	2	3	3	-	6	-	-	-	-	
		13.50	14.00	0.50	U	-	-	-	-	-	-	-	-	-	
	(-)6.7	14.00	14.45	0.45	P-D	2	3	5	-	8	-	-	-	-	14.00m
		15.50	15.95	0.45	P-D	3	4	6	-	10	-	-	-	-	Stiff bluish grey silty clay with occasional traces of calcareous nodules
		16.50	17.00	0.50	U	-	-	-	-	-	-	-	-	-	
		17.00	17.45	0.45	P-D	5	6	10	-	16	-	-	-	-	
		18.50	18.95	0.45	P-D	4	6	7	-	13	-	-	-	-	
	(-)12.2	19.50	20.00	0.50	U	-	-	-	-	-	-	-	-	-	19.50m
		20.00	20.45	0.45	P-D	6	11	20	-	31	-	-	-	-	Very stiff / hard yellowish grey silty clay with high silt content to medium dense yellowish grey clayey sandy silt
		21.50	21.95	0.45	P-D	10	12	19	-	31	-	-	-	-	
	(-)14.7														22.00m
		23.00	23.45	0.45	P-D	12	15	20	-	35	-	-	-	-	Medium dense yellowish grey silty sand

NOTES

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2. Level at which Artesian Condition experienced and its pressure, if any :
3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
CONSULTANTS PVT. LTD.

BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-10

Location : N 22°32'28.88" , E 88°18'1.53"

Ground Elevation : +7.3m

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Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.91m

Date : From 17.11.20 To 20.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		24.50	24.95	0.45	P-D	13	16	24	-	40	-	-	-	-	Medium dense yellowish grey silty sand
		26.00	26.45	0.45	P-D	17	18	19	-	37	-	-	-	-	
	(-)19.7	27.00	27.50	0.50	U	-	-	-	-	-	-	-	-	-	27.00m
19/11		27.50	27.95	0.45	P-D	7	7	12	-	19	-	-	-	-	Very stiff to hard bluish grey to yellowish brown silty clay to sandy silty clay
		29.00	29.45	0.45	P-D	10	12	15	-	27	-	-	-	-	
		30.00	30.50	0.50	U	-	-	-	-	-	-	-	-	-	
		30.50	30.95	0.45	P-D	12	19	22	-	41	-	-	-	-	
		32.00	32.45	0.45	P-D	11	16	19	-	35	-	-	-	-	
		33.50	33.95	0.45	P-D	12	17	21	-	38	-	-	-	-	
		35.00	35.45	0.45	P-D	10	15	20	-	35	-	-	-	-	
		36.50	36.95	0.45	P-D	13	20	31	-	51	-	-	-	-	
		38.00	38.45	0.45	P-D	16	38	45	-	83	-	-	-	-	
		39.50	39.95	0.45	P-D	8	15	26	-	41	-	-	-	-	
		41.00	41.45	0.45	P-D	11	20	24	-	44	-	-	-	-	

NOTES

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3. Water Loss with depth, if any :
4. Colour of water during drilling :

Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-10

Location : N 22°32'28.88" , E 88°18'1.53"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.10m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-12.91m

Date : From 17.11.20 To 20.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		42.50	42.95	0.45	P-D	13	19	26	-	45	-	-	-	-	Very stiff to hard bluish grey to yellowish brown silty clay to sandy silty clay
20/11		44.00	44.45	0.45	P-D	13	19	22	-	41	-	-	-	-	
	(-)37.7														45.00m
		45.50	45.68	0.18	P-D	70	41 (3cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow to yellowish grey silty sand
		47.00	47.28	0.28	P-D	34	82 (13cm)	-	-	>100	-	-	-	-	
		48.50	48.83	0.33	P-D	42	77	32 (3cm)	-	>100	-	-	-	-	
		50.00	50.28	0.28	P-D	33	83 (13cm)	-	-	>100	-	-	-	-	
	(-)42.7	50.00 (Termination Depth)													

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2. Level at which Artesian Condition experienced and its pressure, if any :
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Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-11

Location : N 22°32'27.63" , E 88°18'1.01"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.84m

Date : From 21.11.20 To 23.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
21/11	+7.3	0.00													Fill consisting of grey sand with stone / brick pieces etc.
		0.50	-	-	D	-	-	-	-	-	-	-	-	-	
	+6.5														0.80m
		1.00	1.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft grey sandy silty clay; very loose to loose grey clayey sandy silt to silty fine sand observed from 4.5m depth
		1.50	1.95	0.45	P-D	2	2	2	-	4	-	-	-	-	
		2.50	3.00	0.50	U	-	-	-	-	-	-	-	-	-	
		3.00	3.45	0.45	P-D	1	1	1	-	2	-	-	-	-	
		4.00	4.50	0.50	U	-	-	-	-	-	-	-	-	-	
		4.50	4.95	0.45	P-D	1	1	1	-	2	-	-	-	-	
		5.50	6.00	0.50	U	Slipped				-	-	-	-	-	
		6.00	6.45	0.45	P-D	2	3	3	-	6	-	-	-	-	
		7.00	7.50	0.50	U	-	-	-	-	-	-	-	-	-	
	(-)0.2	7.50	7.95	0.45	P-D	1	1	2	-	3	-	-	-	-	7.50m
		8.50	9.00	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood
		9.00	9.45	0.45	P-D	1	2	3	-	5	-	-	-	-	

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Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

CONSTELL
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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-11

Location : N 22°32'27.63" , E 88°18'1.01"

Ground Elevation : +7.3m

Method of Boring / Drilling : Shell / Rotary

Water Level (Static) : 2.05m b.g.l

Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.84m

Date : From 21.11.20 To 23.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		10.00	10.50	0.50	U	-	-	-	-	-	-	-	-	-	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood
		10.50	10.95	0.45	P-D	2	3	3	-	6	-	-	-	-	
		11.50	12.00	0.50	U	-	-	-	-	-	-	-	-	-	
		12.00	12.45	0.45	P-D	1	2	3	-	5	-	-	-	-	
		13.50	13.95	0.45	P-D	2	2	3	-	5	-	-	-	-	
	(-)7.2	14.50	15.00	0.50	U	-	-	-	-	-	-	-	-	-	14.50m
		15.00	15.45	0.45	P-D	3	4	4	-	8	-	-	-	-	Stiff bluish grey silty clay with occasional traces of calcareous nodules
		16.50	16.95	0.45	P-D	4	5	8	-	13	-	-	-	-	
		17.50	18.00	0.50	U	-	-	-	-	-	-	-	-	-	
	(-)10.7	18.00	18.45	0.45	P-D	7	8	9	-	17	-	-	-	-	18.00m
		19.50	19.95	0.45	P-D	5	7	10	-	17	-	-	-	-	Very stiff greyish yellow silty clay with high silt content to medium dense clayey sandy silt
		21.00	21.45	0.45	P-D	10	17	19	-	36	-	-	-	-	
	(-)15.2	22.50	22.95	0.45	P-D	12	20	37	-	57	-	-	-	-	22.50m
		24.00	24.45	0.45	P-D	8	15	24	-	39	-	-	-	-	Medium dense / dense greyish yellow silty sand

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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-11

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Boring / Drilling Equipment : Mechanical Winch (W-3)

Dia.of Boring / Drilling: Sx (150mm)

Casing Lowered : Sx-15.84m

Date : From 21.11.20 To 23.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m)		Length (m)	Nature of Sampling	SPT : No. of blows					Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		From	To			0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value					
		25.50	25.95	0.45	P-D	22	30	31	-	61	-	-	-	-	Medium dense / dense greyish yellow silty sand
22/11	(-)19.7	27.00	27.45	0.45	P-D	4	5	8	-	13	-	-	-	-	27.00m
		28.00	28.50	0.50	U	-	-	-	-	-	-	-	-	-	Stiff to very stiff / hard bluish grey to brownish yellow silty clay to sandy silty clay
		28.50	28.95	0.45	P-D	4	8	11	-	19	-	-	-	-	
		30.00	30.45	0.45	P-D	6	9	12	-	21	-	-	-	-	
		31.00	31.50	0.50	U	-	-	-	-	-	-	-	-	-	
		31.50	31.95	0.45	P-D	3	7	13	-	20	-	-	-	-	
		33.00	33.45	0.45	P-D	11	14	18	-	32	-	-	-	-	
		34.50	34.95	0.45	P-D	9	16	17	-	33	-	-	-	-	
		36.00	36.45	0.45	P-D	11	15	18	-	33	-	-	-	-	
		37.50	37.95	0.45	P-D	10	20	20	-	40	-	-	-	-	
		39.00	39.45	0.45	P-D	18	22	22	-	44	-	-	-	-	
		40.50	40.81	0.31	P-D	23	85	30 (1cm)	-	>100	-	-	-	-	
		42.00	42.45	0.45	P-D	29	49	36	-	85	-	-	-	-	

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Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

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BORE / DRILL LOG

Project: Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

Bore Hole No. : BH-11

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Date : From 21.11.20 To 23.11.20

Date (dd / mm)	Elevation (m)	Depth / RUN (m) From	Depth / RUN (m) To	Length (m)	Nature of Sampling	SPT : No. of blows 0-15 cm	15-30 cm	30-45 cm	45-60 cm	N' Value	Time Taken (min)	Total length of Core Pieces (m)	Core Recovery (%)	R.Q.D. (%)	Description
		43.50	43.95	0.45	P-D	27	51	53	-	104	-	-	-	-	Stiff to very stiff / hard bluish grey to brownish yellow silty clay to sandy silty clay
23/11	(-)37.7	45.00	45.36	0.36	P-D	8	60	40 (6cm)	-	>100	-	-	-	-	45.00m
		46.50	46.67	0.17	P-D	15	35 (2cm)	-	-	>100	-	-	-	-	Dense / very dense brownish yellow silty sand
		48.00	48.45	0.45	P-D	30	52	56	-	108	-	-	-	-	
		50.00	50.27	0.27	P-D	33	80 (12cm)	-	-	>100	-	-	-	-	
	(-)42.7	50.00 (Termination Depth)													

NOTES

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Site Engineer : M. Gain | Driller: M. Barui | **Job No.: CCPL/20101211**

GRAPHICAL REPRESENTATION OF FIELD N-VALUE WITH R.L.

Project : Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No.: CCPL/20101211 Fig No.: B/1

GRAPHICAL REPRESENTATION OF FIELD N-VALUE WITH R.L.

Project : Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No.: CCPL/20101211 Fig No.: B/2

GRAPHICAL REPRESENTATION OF CORRECTED N-VALUE WITH R.L.

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No.:	CCPL/20101211
		Fig No.:	B/3

GRAPHICAL REPRESENTATION OF CORRECTED N-VALUE WITH R.L.

Project : Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No.: CCPL/20101211 Fig No.: B/4

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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-1	0.50	Soft to firm grey sandy silty clay to silty clay	-	-	-	27.6	53.9	18.5	30.2	1.837	1.411	38.4	20.1	18.3	UU UC UC_R	23 25 19	3.0 - -	2.67	-	-	-	2.96	$1.2x10^{-7}$
	1.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.00		-	-	-	23.9	52.5	23.6	28.1	1.874	1.463	40.2	18.4	21.8	UU UC UC_R	30 32 27	2.0 - -	2.67	0.2666	0.1461	0.8251	3.10	$1.3x10^{-7}$
	2.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.50		-	-	-	0.6	76.9	22.5	30.9	1.850	1.413	44.0	23.2	20.8	UU UC UC_R	27 31 25	4.0 - -	2.67	0.2737	0.1449	0.8892	3.04	$1.9x10^{-7}$
	4.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.00	5.00m Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood	-	-	-	1.6	72.9	25.5	44.9	1.707	1.178	62.9	27.0	35.9	UU UC UC_R	22 24 18	2.5 - -	2.61	0.3626	0.1637	1.2155	2.94	$1.3x10^{-7}$
	5.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.50		-	-	-	6.1	64.2	29.7	83.5	1.445	0.787	99.3 **55.4	43.9 29.3	55.4 26.1	UU UC UC_R	14 15 8	1.5 - -	2.59	1.1049	0.3359	2.2890	0.54	$5.1x10^{-7}$
	7.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		-	-	-	0.8	67.4	31.8	49.7	1.603	1.071	59.8	27.9	31.9	UU UC UC_R	16 17 13	2.5 - -	2.59	0.6916	0.2859	1.4187	0.35	$2.7x10^{-7}$
	8.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/1-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-1	9.50	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood	-	-	-	1.1	68.8	30.1	53.5	1.579	1.029	70.1	31.3	38.8	UU UC UC_R	17 20 14	3.0 - -	2.58	0.7723	0.3079	1.5081	0.36	$1.3x10^{-7}$
	10.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00	11.00m Stiff / very stiff bluish grey to greyish yellow silty clay	-	-	0.2	2.8	63.3	33.7	27.0	1.929	1.519	49.4	19.5	29.9	UU UC UC_R	51 54 44	2.5 - -	2.68	0.3008	0.1705	0.7644	3.43	$1.5x10^{-8}$
	11.50		10	10	-	3.3	54.7	42.0	-	-	-	68.4	19.9	48.5	-	-	-	-	-	-	-	-	-
	13.00		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14.00		-	-	-	1.3	53.8	44.9	25.4	1.959	1.562	55.9	18.5	37.4	UU UC UC_R	77 82 68	2.5 - -	2.69	0.2463	0.1431	0.7219	3.75	$6.3x10^{-9}$
	14.50		18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00		14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		-	-	-	0.7	74.4	24.9	26.0	1.947	1.545	41.5	21.2	20.3	UU UC UC_R	66 74 54	4.0 - -	2.68	0.2566	0.1479	0.7344	3.62	$1.3x10^{-8}$
	17.50	17.50m Hard greyish yellow sandy silty clay with occasional presence of gravels	#400	-	14.6	14.9	56.9	13.6	-	-	-	28.4	16.4	12.0	-	-	-	-	-	-	-	-	-
	19.00		39	39	1.9	15.0	66.4	16.7	-	-	-	34.4	18.9	15.5	-	-	-	-	-	-	-	-	-
	20.50		47	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	22.00	22.00m	95	48	-	72.5	*27.5		17.6	$2.050	1.743	-	-	-	DS_R	10	36.0	-	-	-	-	-	-
	23.50	Dense yellowish grey silty sand	83	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/1-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-1	25.00	25.00m	20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26.00	Very stiff / hard bluish to brownish grey silty clay with brown spots	-	-	-	0.8	65.2	34.0	25.3	1.962	1.566	49.0	19.5	29.5	UU UC UC_R	91 96 74	2.5 - -	2.68	0.2279	0.1332	0.7115	-	$1.2x10^{-8}$
	26.50		20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		-	-	-	1.2	64.9	33.9	24.9	1.970	1.577	53.6	21.3	32.3	UU UC UC_R	93 98 73	2.0 - -	2.69	0.2374	0.1392	0.7055	-	$8.3x10^{-9}$
	29.50		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		23	23	0.3	5.7	53.2	40.8	-	-	-	48.5	18.3	30.2	-	-	-	-	-	-	-	-	-
	32.50		32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	34.00		35	35	-	2.2	67.6	30.2	-	-	-	43.4	17.6	25.8	-	-	-	-	-	-	-	-	-
	35.50		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00	36.50m Dense / very dense brownish to greyish yellow silty sand; medium dense brownish grey silty clayey sand observed at 38.5m and 48.0m depth	#295	100	0.1	76.3	*23.6		17.3	$2.084	1.777	-	-	-	DS_R	10	38.5	-	-	-	-	-	-
	38.50		21	13	-	64.8	21.6	13.6	-	-	-	25.7	15.2	10.5	-	-	-	-	-	-	-	-	-
	40.00		#188	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	41.50		#259	82	-	87.1	*12.9		19.4	$2.073	1.736	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	43.00		#382	115	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/1-3

CONSTELL CONSULTANTS PVT. LTD.

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-1	44.50	Dense / very dense brownish to greyish yellow silty sand; medium dense brownish grey silty clayey sand observed at 38.5m and 48.0m depth	#200	62	-	78.1	*21.9		18.2	$2.078	1.758	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	46.00		#175	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		68	25	-	55.9	30.3	13.8	-	-	-	25.1	15.0	10.1	-	-	-	-	-	-	-	-	-
	50.00		#152	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/1-4

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-2	0.00	Very loose / loose yellowish grey silty fine sand	-	-	-	67.7	*32.3		31.9	1.755	1.331	Non-plastic			DS	12	26.0	2.65	-	-	-	0.60	3.1×10^{-5}
	0.50		2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.00	2.00m	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.00	Soft / firm grey silty clay	-	-	-	0.3	64.2	35.5	31.5	1.832	1.393	50.8	19.8	31.0	UU UC UC_R	23 25 21	2.5 - -	2.67	0.3269	0.1706	0.9165	2.96	8.9×10^{-8}
	3.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.00	5.00m	5	5	-	0.7	69.2	30.1	-	-	-	51.4	25.2	26.2	-	-	-	-	-	-	-	-	-
	6.00	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 9.0m depth	-	-	-	0.1	68.4	31.5	41.5	1.705	1.205	53.0	25.4	27.6	UU UC UC_R	22 24 20	2.5 - -	2.59	0.4314	0.2007	1.1495	2.94	2.1×10^{-7}
	6.50		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		2	2	-	0.1	57.5	42.4	-	-	-	67.7	27.2	40.5	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	1.1	69.1	29.8	80.4	1.485	0.823	109.0 **59.8	47.3 27.8	61.7 32.0	UU UC UC_R	17 19 14	3.0 - -	2.57	1.0496	0.3362	2.1221	0.35	2.7×10^{-7}
	9.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00	11.00m	10	10	-	4.7	45.8	49.5	-	-	-	65.7	21.8	43.9	-	-	-	-	-	-	-	-	-
	12.00	Stiff to very stiff bluish grey silty clay	-	-	-	8.0	46.1	45.9	26.4	1.946	1.540	60.0	18.0	42.0	UU UC UC_R	66 70 61	3.0 - -	2.68	0.2686	0.1543	0.7408	3.62	1.2×10^{-8}

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/2-1

CONSTELL CONSULTANTS PVT. LTD.

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-2	12.50	Stiff to very stiff bluish grey silty clay	17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14.00		16	16	-	0.2	58.8	41.0	-	-	-	51.0	18.4	32.6	-	-	-	-	-	-	-	-	-
	15.00	——— 15.00m ——— Stiff / very stiff greyish yellow silty clay with high silt content	-	-	-	1.5	75.6	22.9	24.5	1.963	1.577	41.5	19.8	21.7	UU UC UC_R	68 73 50	4.5 - -	2.68	0.2495	0.1468	0.6997	3.65	$5.3x10^{-8}$
	15.50		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		17	17	-	8.8	75.8	15.4	-	-	-	33.3	18.3	15.0	-	-	-	2.67	-	-	-	-	-
		——— 18.00m ——— Medium dense greyish yellow silty sand; hard yellowish grey silty clay with kankars observed at 21.5m depth																					
	18.50		48	29	-	69.1	*30.9		22.3	$1.980	1.619	-	-	-	DS_R	18	34.0	2.65	-	-	-	0.68	-
	20.00		24	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.50		36	36	3.7	8.0	73.3	15.0	-	-	-	31.4	18.9	12.5	-	-	-	-	-	-	-	-	-
	23.00		67	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24.50		29	19	1.1	75.8	*23.1		23.1	$1.950	1.584	-	-	-	DS_R	10	33.5	-	-	-	-	0.94	-
	25.50	——— 25.50m ——— Very stiff to hard bluish grey to brownish yellow silty clay	-	-	-	0.1	51.8	48.1	26.1	1.954	1.550	68.8	20.6	48.2	UU UC UC_R	75 85 65	3.5 - -	2.68	0.2839	0.1641	0.7295	3.73	$1.8x10^{-9}$
	26.00		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		-	-	2.7	5.5	55.9	35.9	24.6	1.983	1.591	55.0	21.6	33.4	UU UC UC_R	109 115 96	1.5 - -	2.68	0.2171	0.1289	0.6840	4.09	$4.2x10^{-9}$

$ Remoulded density
*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/2-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-2	27.50	Very stiff to hard bluish grey to brownish yellow silty clay	32	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		23	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		-	-	-	1.6	56.7	41.7	22.8	2.040	1.661	54.5	19.7	34.8	UU UC UC_R	137 147 133	2.0 - -	2.70	0.1935	0.1191	0.6253	4.34	2.6×10^{-9}
	30.50		36	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		40	40	-	1.2	57.1	41.7	-	-	-	54.9	21.2	33.7	-	-	-	-	-	-	-	-	-
	33.50		40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	35.00		52	52	-	5.5	70.5	24.0	-	-	-	40.6	17.3	23.3	-	-	-	2.68	-	-	-	-	-
	36.50		97	97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	38.00	38.00m	#281	91	1.0	81.2	*17.8		17.2	$2.080	1.775	-	-	-	DS_R	0	38.0	-	-	-	-	-	-
	39.50	Dense / very dense brownish yellow silty sand	#562	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	41.00		105	37	2.0	85.2	*12.8		19.5	$2.031	1.700	-	-	-	DS_R	0	36.5	-	-	-	-	-	-
	42.50		#203	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00		#270	80	0.3	87.7	*12.0		17.6	$2.078	1.767	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	45.50		#462	128	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/2-3

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-2	47.00	Dense / very dense brownish yellow silty sand	#960	253	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.50		#251	70	1.5	85.0	*13.5		19.0	$2.070	1.739	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	50.00		#200	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/2-4

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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-3	1.00	Very soft to soft grey silty clay with varying percentage of decomposed wood	-	-	-	0.5	53.2	46.3	54.7	1.563	1.010	73.2	29.5	43.7	UU UC UC_R	13 14 9	1.0 - -	2.62	-	-	-	0.34	4.0×10^{-7}
	1.50		1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.50		-	-	-	1.0	61.2	37.8	48.4	1.634	1.101	59.1	25.5	33.6	UU UC UC_R	14 15 8	2.0 - -	2.60	0.4496	0.1904	1.3613	0.36	3.0×10^{-7}
	3.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	-	1.8	72.2	26.0	42.0	1.675	1.180	51.8	25.1	26.7	UU UC UC_R	19 21 14	2.5 - -	2.62	0.3520	0.1585	1.2211	0.39	4.1×10^{-7}
	4.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.50		-	-	-	0.7	71.3	28.0	47.5	1.621	1.099	56.9	26.7	30.2	UU UC UC_R	12 13 9	1.5 - -	2.60	0.5185	0.2191	1.3658	0.35	5.1×10^{-7}
	6.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	0.3	60.8	38.9	51.0	1.610	1.066	69.9	28.0	41.9	UU UC UC_R	14 15 10	1.5 - -	2.60	0.6093	0.2499	1.4385	0.35	2.1×10^{-7}
	7.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.50		-	-	-	0.4	67.9	31.7	48.5	1.632	1.099	61.8	25.8	36.0	UU UC UC_R	15 16 10	2.0 - -	2.62	0.5685	0.2385	1.3840	0.35	3.7×10^{-7}
	9.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/3-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-3	10.00	Very soft to soft grey silty clay with varying percentage of decomposed wood	-	-	-	1.0	63.8	35.2	46.0	1.650	1.130	69.0	27.7	41.3	UU UC UC_R	17 19 13	1.5 - -	2.63	0.5624	0.2417	1.3271	0.35	2.1×10^{-7}
	10.50		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00	13.00m Stiff bluish grey to brownish yellow silty clay	-	-	-	1.1	53.2	45.7	28.5	1.902	1.480	65.9	22.4	43.5	UU UC UC_R	39 42 29	2.0 - -	2.69	0.3284	0.1807	0.8174	3.25	8.3×10^{-9}
	13.50		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00		-	-	-	0.2	69.6	30.2	26.1	1.943	1.541	48.4	21.4	27.0	UU UC UC_R	74 79 52	2.5 - -	2.68	0.2569	0.1477	0.7393	3.72	4.4×10^{-8}
	16.50		11	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.00	18.00m Very stiff to hard brownish yellow sandy silty clay	27	27	-	16.1	74.7	9.2	-	-	-	32.7	21.7	11.0	-	-	-	2.67	-	-	-	-	-
	19.50		47	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.00		38	38	-	23.0	61.5	15.5	-	-	-	38.1	20.3	17.8	-	-	-	-	-	-	-	-	-
	22.50	22.50m Dense / very dense brownish yellow silty sand	72	37	0.3	54.3	*45.4		21.4	$2.028	1.671	-	-	-	DS_R	16	35.5	-	-	-	-	0.65	-
	24.00		#148	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.00	25.00m Very stiff bluish to brownish grey silty clay	-	-	-	0.4	52.4	47.2	24.0	1.980	1.597	69.1	19.5	49.6	UU UC UC_R	108 115 96	2.0 - -	2.69	0.2211	0.1312	0.6847	4.08	5.5×10^{-9}

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/3-2

CONSTELL CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-3	25.50	Very stiff bluish to brownish grey silty clay	24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		27	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		-	-	-	3.1	47.3	49.6	23.5	2.021	1.636	69.3	21.7	47.6	UU UC UC_R	122 129 107	1.5 - -	2.69	0.2092	0.1273	0.6438	4.21	6.1×10^{-9}
	28.50		30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		26	26	-	0.9	53.6	45.5	-	-	-	60.8	20.1	40.7	-	-	-	-	-	-	-	-	-
	31.50		38	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00		28	28	-	1.7	52.4	45.9	-	-	-	65.1	22.8	42.3	-	-	-	-	-	-	-	-	-
	34.50		27	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.00		30	30	-	15.4	62.1	22.5	-	-	-	41.3	20.5	20.8	-	-	-	-	-	-	-	-	-
	37.50	——— 37.50m ———	#140	50	-	81.0	*19.0		18.3	$2.058	1.740	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	39.00	Dense / very dense brownish yellow silty sand; hard greyish brown sandy silty clay observed at 43.5m depth	#135	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.50		67	27	1.7	77.3	*21.0		20.8	$2.028	1.679	-	-	-	DS_R	12	35.0	-	-	-	-	-	-
	42.00		#168	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.50		62	62	-	15.1	58.7	26.2	-	-	-	51.1	20.4	30.7	-	-	-	-	-	-	-	-	-
	45.00		107	36	1.3	72.7	*26.0		18.4	$2.042	1.725	-	-	-	DS_R	15	36.0	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/3-3

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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-3	46.50	Dense / very dense brownish yellow silty sand; hard greyish brown sandy silty clay observed at 43.5m depth	#156	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		#210	61	-	87.3	*12.7		16.4	$2.070	1.778	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	50.00		#174	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/3-4

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-4	0.50	Firm grey silty clay to silty clay with high silt content	-	-	-	0.7	68.3	31.0	31.5	1.840	1.399	51.5	23.3	28.2	UU UC UC_R	28 31 24	2.0 - -	2.68	-	-	-	3.06	$3.6x10^{-8}$
	1.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.00		-	-	-	0.8	83.9	15.3	29.0	1.863	1.444	37.3	23.5	13.8	UU UC UC_R	29 30 18	4.0 - -	2.67	0.2499	0.1352	0.8488	3.08	$4.7x10^{-6}$
	2.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.50	——— 3.50m ———	-	-	-	26.4	42.0	31.6	148.7	1.260	0.507	182.5 **67.0	83.8 35.0	98.7 32.0	UU UC UC_R	20 22 9	2.5 - -	2.56	0.9091	0.1799	4.0530	2.89	$6.0x10^{-7}$
	4.00	Soft grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 3.5m depth	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.00		-	-	-	1.2	73.5	25.3	43.4	1.660	1.158	54.0	26.7	27.3	UU UC UC_R	22 23 14	2.0 - -	2.62	0.4144	0.1831	1.2633	2.94	$2.9x10^{-7}$
	5.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.50		-	-	-	2.9	58.5	38.6	50.4	1.603	1.066	65.6	27.1	38.5	UU UC UC_R	15 16 11	1.5 - -	2.60	0.6064	0.2486	1.4394	0.42	$2.1x10^{-7}$
	7.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.00		-	-	-	2.0	68.3	29.7	53.1	1.625	1.061	66.0	28.6	37.4	UU UC UC_R	16 17 10	1.5 - -	2.61	0.6201	0.2522	1.4590	0.41	$2.9x10^{-7}$
	8.50		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/4-1

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-4	9.50	Soft grey silty clay / clayey silt with varying percentage of decomposed wood; plenty of wood observed at 3.5m depth	-	-	-	2.0	61.2	36.8	56.8	1.570	1.001	75.7	34.1	41.6	UU UC UC_R	18 20 12	2.0 - -	2.60	0.5917	0.2279	1.5967	0.37	$1.8x10^{-7}$
	10.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.00	11.00m Stiff to very stiff bluish grey silty clay	-	-	-	1.8	73.2	25.0	27.9	1.920	1.501	46.3	23.3	23.0	UU UC UC_R	52 56 45	3.0 - -	2.68	0.3109	0.1741	0.7853	3.44	$4.4x10^{-8}$
	11.50		9	9	-	2.0	70.0	28.0	-	-	-	48.0	21.0	27.0	-	-	-	-	-	-	-	-	-
	13.00		14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14.00		-	-	-	0.5	60.9	38.6	25.1	1.970	1.575	58.0	20.1	37.9	UU UC UC_R	95 98 80	2.0 - -	2.69	0.2507	0.1468	0.7082	3.95	$6.0x10^{-9}$
	14.50		20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00	16.00m Stiff yellowish grey silty clay with high silt content / clayey silt	15	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	17.00		-	-	-	6.3	84.3	9.4	25.4	1.949	1.554	33.5	23.5	10.0	UU UC UC_R	51 59 40	4.5 - -	2.67	0.2166	0.1261	0.7179	3.43	$1.3x10^{-6}$
	17.50	17.50m Medium dense to dense yellowish grey silty sand	24	18	-	64.6	*35.4		26.9	$1.900	1.497	-	-	-	DS_R	15	32.0	-	-	-	-	0.64	-
	19.00		40	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	20.50		37	23	-	71.8	*28.2		22.9	$1.980	1.611	-	-	-	DS_R	10	34.0	2.65	-	-	-	0.67	-
	22.00		70	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	23.50		63	32	1.6	81.9	*16.5		20.1	$2.020	1.682	-	-	-	DS_R	0	36.5	-	-	-	-	0.97	-

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/4-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-4	25.00	25.00m	17	17	-	0.3	50.9	48.8	-	-	-	69.1	22.5	46.6	-	-	-	-	-	-	-	-	-
	26.00	Very stiff to hard bluish to brownish grey silty clay with occasional brown spots	-	-	-	3.2	40.3	56.5	26.6	1.958	1.547	70.4	20.9	49.5	UU UC UC_R	72 78 60	1.5 - -	2.69	0.2400	0.1380	0.7393	3.70	$2.7x10^{-8}$
	26.50		29	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00		32	32	-	6.6	48.0	45.4	-	-	-	64.0	23.2	40.8	-	-	-	-	-	-	-	-	-
	29.50		28	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		34	34	-	6.4	54.8	38.8	-	-	-	57.2	22.9	34.3	-	-	-	-	-	-	-	-	-
	32.50		34	34	-	9.0	67.0	24.0	-	-	-	46.0	20.1	25.9	-	-	-	-	-	-	-	-	-
	34.00		32	32	-	14.3	64.7	21.0	-	-	-	39.7	19.2	20.5	-	-	-	-	-	-	-	-	-
	35.50	35.80m	105	105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.00	Dense / very dense brownish yellow silty sand	#214	73	4.1	75.6	*20.3		18.6	$2.069	1.745	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	38.50		#240	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.00		#231	74	-	53.2	*46.8		18.8	$2.076	1.747	-	-	-	DS_R	12	37.5	-	-	-	-	-	-
	41.50		#285	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.00		#164	53	-	82.0	*18.0		17.7	$2.059	1.749	-	-	-	DS_R	0	38.0	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/4-3

CONSTELL
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-4	44.50	Dense / very dense brownish yellow silty sand	#184	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.00		#304	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		#134	41	3.0	56.5	*40.5		18.8	$2.051	1.726	-	-	-	DS_R	0	36.5	-	-	-	-	-	-
	50.00		#960	243	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/4-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-5		Fill consisting of grey silty sand with stone / brick pieces etc.																					
		0.70m																					
	1.00	Firm grey silty clay to silty clay with high silt content; loose yellowish grey fine sand observed from 2.5m to 4.0m depth	-	-	-	0.7	65.3	34.0	31.5	1.813	1.379	53.9	22.9	31.0	UU UC UC_R	23 24 18	2.5 - -	2.68	0.3167	0.1629	0.9439	2.96	6.0×10^{-8}
	1.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.50		-	-	-	93.9	*6.1		28.6	1.755	1.365	-	-	-	DS	0	27.0	2.65	-	-	-	0.77	2.1×10^{-4}
	3.00		4	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	-	0.7	81.3	18.0	31.1	1.830	1.396	38.8	23.3	15.5	UU UC UC_R	22 25 15	4.0 - -	2.67	0.2816	0.1472	0.9128	2.94	6.9×10^{-7}
	4.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.50	5.50m	-	-	-	0.4	60.3	39.3	48.1	1.632	1.102	66.8	28.8	38.0	UU UC UC_R	21 23 12	3.0 - -	2.59	0.5069	0.2157	1.3503	2.92	8.2×10^{-7}
		Soft to firm grey silty clay with varying percentage of decomposed wood																					
	6.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	1.3	59.4	39.3	59.7	1.540	0.964	79.1	34.6	44.5	UU UC UC_R	14 16 10	2.0 - -	2.58	0.7084	0.2648	1.6755	0.36	1.2×10^{-7}
	7.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.50		-	-	-	0.5	72.3	27.2	39.4	1.720	1.234	50.4	25.7	24.7	UU UC UC_R	17 19 13	2.5 - -	2.62	0.4564	0.2149	1.1234	0.35	4.0×10^{-7}

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/5-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-5	9.00	Soft to firm grey silty clay with varying percentage of decomposed wood	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		-	-	-	0.5	70.7	28.8	40.7	1.702	1.210	50.1	25.5	24.6	UU UC UC_R	15 16 9	3.0 - -	2.60	0.4896	0.2278	1.1493	0.35	$4.5x10^{-7}$
	10.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	2.4	67.3	30.3	36.4	1.755	1.287	50.1	26.1	24.0	UU UC UC_R	28 31 23	3.0 - -	2.64	0.3945	0.1923	1.0518	3.06	$7.1x10^{-8}$
	13.50		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00	———— 15.00m ————	17	17	5.4	10.9	44.2	39.5	-	-	-	59.5	20.6	38.9	-	-	-	-	-	-	-	-	-
	16.00	Stiff bluish grey to brownish yellow silty clay with occasional presence of calcareous nodules	-	-	-	0.6	70.7	28.7	27.3	1.934	1.519	50.2	21.2	29.0	UU UC UC_R	47 52 38	2.0 - -	2.68	0.2791	0.1582	0.7640	3.37	$4.1x10^{-8}$
	16.50		9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.00		10	10	-	0.5	70.0	29.5	-	-	-	50.1	21.0	29.1	-	-	-	-	-	-	-	-	-
	19.50	———— 19.50m ————	21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.00	Very stiff brownish yellow silty clay (high silt content) / clayey silt with sand; medium dense sandy silt observed from 22.5m depth	25	25	0.4	18.7	72.9	8.0	-	-	-	30.7	22.5	8.2	-	-	-	-	-	-	-	-	-
	22.50		30	19	-	39.1	56.8	4.1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.55	-
		———— 23.00m ————																					
	24.00	Medium dense to dense yellowish grey silty sand	41	23	-	75.0	*25.0		25.0	$1.940	1.552	-	-	-	DS_R	10	33.0	-	-	-	-	0.74	-

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/5-2

CONSTELL
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-5	25.50	Medium dense to dense yellowish grey silty sand	74	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27.00		90	39	6.2	67.8	*26.0		21.0	$2.030	1.678	-	-	-	DS_R	12	36.5	2.67	-	-	-	1.39	-
		28.00m																					
	28.50	Stiff / very stiff to hard bluish to yellowish grey silty clay with occasional brown spots	15	15	-	1.2	47.7	51.1	-	-	-	70.3	19.9	50.4	-	-	-	-	-	-	-	-	-
	29.50		-	-	-	2.7	47.8	49.5	26.2	1.958	1.552	65.9	22.0	43.9	UU UC UC_R	72 80 61	2.0 - -	2.69	0.2634	0.1519	0.7338	3.70	$2.7x10^{-8}$
	30.00		18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.50		24	24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.50		-	-	1.7	3.0	45.5	49.8	23.8	2.008	1.622	64.2	20.2	44.0	UU UC UC_R	107 118 94	3.0 - -	2.70	0.2372	0.1425	0.6646	-	$5.7x10^{-9}$
	33.00		29	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	34.50		33	33	-	1.3	53.8	44.9	-	-	-	64.1	20.7	43.4	-	-	-	-	-	-	-	-	-
	36.00		36	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	37.50		33	33	-	9.8	65.8	24.4	-	-	-	47.2	20.7	26.5	-	-	-	-	-	-	-	-	-
	39.00	39.00m	#210	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40.50	Medium dense / dense to very dense brownish to greyish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth	77	29	0.5	86.6	*12.9		22.6	$2.026	1.653	-	-	-	DS_R	0	35.0	-	-	-	-	-	-
	42.00		#174	55	-	82.0	*18.0		19.2	$2.061	1.729	-	-	-	DS_R	10	37.0	-	-	-	-	-	-
	43.50		#169	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/5-3

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-5	45.00	Medium dense / dense to very dense brownish to greyish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth	86	86	-	19.0	53.2	27.8	-	-	-	42.9	16.0	26.9	-	-	-	-	-	-	-	-	-
	46.50		#176	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		102	33	0.4	86.8	*12.8		22.2	$2.021	1.654	-	-	-	DS_R	0	35.0	-	-	-	-	-	-
	50.00		72	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/5-4

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-6	1.50	Fill consisting of brownish grey silty sand with stone / brick pieces etc.	-	-	13.1	43.8	*43.1		23.0	1.830	1.488	-	-	-	-	-	-	-	-	-	-	2.02	-
	2.00	2.00m	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.00	Loose grey sandy silt / silty sand with clay as binder	-	-	-	50.6	40.0	9.4	32.6	1.760	1.327	-	-	-	DS	20	27.5	2.65	-	-	-	0.65	4.3×10^{-5}
	3.50	3.50m	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.50	Soft to firm grey silty clay	-	-	-	1.5	55.3	43.2	35.5	1.801	1.329	61.4	21.8	39.6	UU UC UC_R	12 14 10	1.5 - -	2.68	0.2968	0.1472	1.0163	0.35	2.1×10^{-8}
	5.00		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.00		-	-	-	0.3	76.7	23.0	29.8	1.851	1.426	40.7	20.6	20.1	UU UC UC_R	30 34 26	2.5 - -	2.66	0.2850	0.1528	0.8653	3.10	4.3×10^{-7}
	6.50	6.50m	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.50	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.5m depth	-	-	-	0.5	64.7	34.8	45.8	1.640	1.125	65.6	26.4	39.2	UU UC UC_R	21 24 13	2.0 - -	2.60	0.5503	0.2381	1.3115	2.92	2.1×10^{-7}
	8.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	0.5	65.5	34.0	48.1	1.623	1.096	61.5	24.9	36.6	UU UC UC_R	10 12 7	1.5 - -	2.60	0.4888	0.2060	1.3725	0.35	2.9×10^{-7}
	9.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/6-1

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-6	10.50	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.5m depth	-	-	-	0.5	74.2	25.3	40.2	1.735	1.238	52.8	23.3	29.5	UU UC UC_R	15 17 11	2.0 - -	2.63	0.4297	0.2022	1.1252	0.35	3.3×10^{-7}
	11.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.50		-	-	-	4.7	52.0	43.3	140.1	1.255	0.523	196.8 **94.9	74.1 35.8	122.7 59.1	UU UC UC_R	17 20 10	2.5 - -	2.56	1.8146	0.3705	3.8976	0.40	5.1×10^{-7}
	14.00		7	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.50	15.50m	9	9	-	5.8	41.8	52.4	-	-	-	74.1	23.1	51.0	-	-	-	-	-	-	-	-	-
	16.50	Stiff bluish grey silty clay with occasional traces of calcareous nodules	-	-	4.2	9.5	45.0	41.3	27.0	1.935	1.524	60.2	19.5	40.7	UU UC UC_R	57 64 49	2.5 - -	2.69	0.2929	0.1659	0.7655	3.51	1.7×10^{-8}
	17.00		14	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.50		16	16	-	0.7	70.6	28.7	-	-	-	46.9	21.2	25.7	-	-	-	-	-	-	-	-	-
	20.00	20.00m	50	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.50	Medium dense brownish yellow sandy silt with clay as binder to hard silty clay with high silt content	32	20	0.1	41.8	53.6	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	0.66	-
	23.00		51	51	-	13.8	73.4	12.8	-	-	-	32.3	19.8	12.5	-	-	-	-	-	-	-	-	-
	24.50	24.50m	68	33	-	74.8	*25.2		21.2	$2.028	1.673	-	-	-	DS_R	11	36.0	2.65	-	-	-	0.76	-
	26.00	Dense yellowish grey silty sand	81	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

$ Remoulded density

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/6-2

CONSTELL CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-6	27.00	——— 27.00m ———	-	-	-	2.4	48.1	49.5	26.7	1.961	1.548	67.0	21.1	45.9	UU UC UC_R	78 83 67	1.0 - -	2.68	0.2701	0.1560	0.7315	3.77	6.1×10^{-9}
	27.50	Very stiff to hard bluish grey silty clay; yellowish grey silty clay with varying percentage of sand observed from 36.5m depth	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		-	-	-	3.5	49.3	47.2	25.5	1.970	1.570	65.1	20.5	44.6	UU UC UC_R	92 96 74	1.5 - -	2.69	0.2322	0.1355	0.7137	3.92	4.6×10^{-9}
	30.50		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		23	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.50		38	38	-	11.2	52.1	36.7	-	-	-	50.8	19.4	31.4	-	-	-	-	-	-	-	-	-
	35.00		35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.50		23	23	-	13.9	63.3	22.8	-	-	-	37.4	17.6	19.8	-	-	-	-	-	-	-	-	-
	38.00		65	65	-	49.4	36.2	14.4	-	-	-	30.7	16.8	13.9	-	-	-	-	-	-	-	-	-
	39.50	——— 39.50m ———	#152	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	41.00	Dense / very dense brownish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth	#128	43	0.3	85.1	*14.6		17.4	$2.051	1.747	-	-	-	DS_R	0	37.0	2.67	-	-	-	-	-
	42.50		#194	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	44.00		47	47	-	30.2	44.3	25.5	-	-	-	37.8	16.7	21.1	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/6-3

CONSTELL CONSULTANTS PVT. LTD.

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-6	45.50	Dense / very dense brownish yellow silty sand; hard bluish grey sandy silty clay observed from 44.0m to 45.5m depth	#221	65	-	87.1	*12.9		17.0	$2.067	1.767	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	47.00		#168	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.50		#168	49	-	81.8	*18.2		18.1	$2.060	1.744	-	-	-	DS_R	0	38.0	-	-	-	-	-	-
	50.00		#192	54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/6-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-7	1.00	Fill consisting of grey silty sand with stone / brick pieces etc.	-	-	26.9	34.4	32.8	5.9	24.0	1.855	1.496	-	-	-	-	-	-	-	-	-	-	2.81	-
	1.50	1.50m	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.50	Soft grey silty clay	-	-	-	9.5	49.8	40.7	38.9	1.752	1.261	63.1	22.6	40.5	UU UC UC_R	15 16 10	1.5 - -	2.67	0.4199	0.1984	1.1168	0.42	$5.6x10^{-8}$
	3.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	-	0.2	65.0	34.8	35.5	1.776	1.311	56.6	20.9	35.7	UU UC UC_R	14 17 10	2.0 - -	2.67	0.4022	0.1974	1.0371	0.34	$6.3x10^{-8}$
	4.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.50	5.50m Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 5.5m and 13.5m depth	-	-	-	10.3	53.0	36.7	125.8	1.320	0.585	176.9 **97.6	57.4 63.2	119.5 34.4	UU UC UC_R	16 19 8	2.5 - -	2.57	1.0763	0.2448	3.3963	0.52	$4.0x10^{-7}$
	6.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	0.4	69.8	29.8	41.1	1.742	1.235	53.9	25.1	28.8	UU UC UC_R	22 24 15	1.0 - -	2.58	0.4450	0.2129	1.0898	2.94	$2.1x10^{-7}$
	7.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.50		-	-	-	0.7	71.3	28.0	45.0	1.651	1.139	59.8	25.5	34.3	UU UC UC_R	16 19 12	2.5 - -	2.60	0.4746	0.2079	1.2834	0.36	$2.9x10^{-7}$
	9.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/7-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-7	10.00	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 5.5m and 13.5m depth	-	-	-	9.6	55.4	35.0	48.3	1.616	1.090	69.5	26.7	42.8	UU UC UC_R	17 20 14	2.0 - -	2.62	0.5261	0.2188	1.4044	0.39	2.6×10^{-7}
	10.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	7.1	43.2	49.7	129.3	1.315	0.573	199.7 **92.0	94.8 35.7	104.9 56.3	UU UC UC_R	23 25 14	1.5 - -	2.57	1.6736	0.3734	3.4814	2.96	5.6×10^{-7}
	13.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00	———— 15.00m ————	9	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.00	Stiff bluish grey to brownish yellow silty clay	-	-	0.3	9.2	45.7	44.8	26.6	1.948	1.539	64.1	21.0	43.1	UU UC UC_R	69 72 56	1.0 - -	2.69	0.2769	0.1584	0.7482	3.66	1.3×10^{-8}
	16.50		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.00		15	15	-	0.5	66.3	33.2	-	-	-	51.0	22.0	29.0	-	-	-	-	-	-	-	-	-
	19.50		12	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.00	———— 21.00m ————	15	15	-	6.2	77.1	16.7	-	-	-	37.7	21.8	15.9	-	-	-	2.67	-	-	-	-	-
	22.50	Stiff to very stiff brownish yellow silty clay with high silt content	25	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24.00		31	31	-	4.9	76.1	19.0	-	-	-	42.8	21.9	20.9	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/7-2

CONSTELL
CONSULTANTS PVT. LTD.

CONSTELL
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-7	25.50	25.50m	55	28	-	68.6	*31.4		24.2	$2.019	1.626	-	-	-	DS_R	12	35.0	-	-	-	-	0.63	-
	27.00	Medium dense to very dense brownish yellow silty sand	#139	56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00	28.00m	-	-	-	3.2	46.7	50.1	25.2	1.956	1.562	64.2	21.4	42.8	UU UC UC_R	74 80 60	2.0 - -	2.68	0.2697	0.1572	0.7154	3.72	$6.6x10^{-9}$
	28.50	Very stiff to hard grey to bluish grey silty clay with occasional brown / yellow spots	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		17	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		-	-	-	3.1	49.1	47.8	24.5	1.971	1.583	65.8	21.9	43.9	UU UC UC_R	94 100 85	1.5 - -	2.69	0.2570	0.1513	0.6992	-	$5.1x10^{-9}$
	31.50		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00		24	24	0.8	1.9	49.6	47.7	-	-	-	58.0	17.8	40.2	-	-	-	-	-	-	-	-	-
	34.50		35	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.00		36	36	-	2.6	47.5	49.9	-	-	-	61.8	21.3	40.5	-	-	-	2.70	-	-	-	-	-
	37.50		42	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.00		24	24	-	5.5	74.3	20.2	-	-	-	44.0	21.4	22.6	-	-	-	-	-	-	-	-	-
	40.50	40.50m	#175	57	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	42.00	Dense / very dense brownish yellow medium to fine sand	#214	66	-	95.3	*4.7		19.2	$2.056	1.725	-	-	-	DS_R	0	36.5	-	-	-	-	-	-
	43.50		#166	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/7-3

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-7	45.00	Dense / very dense brownish yellow medium to fine sand	#172	52	-	95.8	*4.2		17.9	$2.064	1.751	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	46.50		#163	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		#150	45	-	96.5	*3.5		17.1	$2.044	1.746	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	50.00		#168	48	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/7-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-8		Fill consisting of yellowish brown silty sand with stone / brick pieces etc.																					
		0.90m																					
	1.00	Firm grey silty clay; medium dense grey silty fine sand with traces of clay observed from 2.5m to 4.0m depth	-	-	-	0.6	73.7	25.7	27.4	1.851	1.453	45.3	20.3	25.0	UU UC UC_R	29 31 22	3.0 - -	2.67	0.3326	0.1810	0.8377	3.08	$1.7x10^{-7}$
	1.50		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.50		-	-	0.9	52.1	41.0	6.0	29.8	1.834	1.413	-	-	-	DS	15	31.0	2.65	-	-	-	0.76	$3.6x10^{-5}$
	3.00		12	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	-	2.1	59.9	38.0	34.8	1.825	1.354	63.4	22.0	41.4	UU UC UC_R	22 24 16	1.5 - -	2.68	0.3209	0.1621	0.9795	2.94	$4.3x10^{-8}$
	4.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5.50	5.50m Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.0m depth	-	-	-	1.1	72.7	26.2	45.4	1.644	1.131	61.7	26.0	35.7	UU UC UC_R	21 23 14	2.5 - -	2.58	0.5036	0.2207	1.2818	2.92	$6.5x10^{-8}$
	6.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	0.8	58.0	41.2	50.8	1.605	1.064	70.6	26.6	44.0	UU UC UC_R	13 15 10	1.5 - -	2.59	0.6197	0.2547	1.4335	0.36	$5.1x10^{-8}$
	7.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.50		-	-	-	0.5	69.0	30.5	43.2	1.664	1.162	52.2	24.0	28.2	UU UC UC_R	14 19 13	2.5 - -	2.60	0.4158	0.1859	1.2375	0.35	$2.9x10^{-7}$

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/8-1

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-8	9.00	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed at 13.0m depth	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		-	-	-	0.9	68.1	31.0	47.0	1.635	1.112	59.8	24.3	35.5	UU UC UC_R	16 18 13	1.5 - -	2.60	0.4617	0.1975	1.3376	0.36	$1.6x10^{-7}$
	10.50		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.00		-	-	-	4.8	63.2	32.0	110.8	1.311	0.622	134.9 **67.5	64.6 37.1	70.3 30.4	UU UC UC_R	20 24 11	3.0 - -	2.56	1.6902	0.4106	3.1163	2.89	$4.3x10^{-7}$
	13.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.00	———— 15.00m ————	10	10	-	3.5	49.4	47.1	-	-	-	64.9	22.4	42.5	-	-	-	-	-	-	-	-	-
	16.00	Stiff bluish grey to greyish yellow silty clay with occasional traces of calcareous nodules	-	-	8.9	8.4	40.9	41.8	26.2	1.935	1.533	60.7	20.5	40.2	UU UC UC_R	56 60 51	2.0 - -	2.69	0.2948	0.1680	0.7544	3.50	$2.1x10^{-8}$
	16.50		10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.00		11	11	-	0.5	71.4	28.1	-	-	-	49.7	23.0	26.7	-	-	-	-	-	-	-	-	-
	19.50		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.00		15	15	-	2.6	70.9	26.5	-	-	-	51.6	21.9	29.7	-	-	-	-	-	-	-	-	-
	22.50	———— 22.50m ————	42	24	0.5	24.1	66.5	8.9	-	-	-	31.7	23.8	7.9	-	-	-	2.66	-	-	-	-	-
	24.00	Medium dense yellowish grey sandy clayey silt to sandy silt with traces of clay	47	25	-	34.6	61.0	4.4	-	-	-	-	-	-	-	-	-	-	-	-	-	0.51	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/8-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-8	25.50	25.50m	30	19	-	64.0	*36.0		25.1	$1.911	1.528	-	-	-	DS_R	10	32.5	-	-	-	-	0.66	-
	27.00	Medium dense to dense yellowish grey silty sand	98	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00	28.00m	-	-	-	0.8	56.2	43.0	25.7	1.958	1.558	62.6	21.3	41.3	UU UC UC_R	80 86 72	1.5 - -	2.69	0.2797	0.1619	0.7269	3.79	$6.1x10^{-9}$
	28.50	Very stiff to hard bluish grey silty clay with yellow spots	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		21	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31.00		-	-	-	5.9	50.1	44.0	25.1	1.965	1.571	56.9	20.1	36.8	UU UC UC_R	89 97 81	2.5 - -	2.68	0.2662	0.1560	0.7062	-	$7.0x10^{-9}$
	31.50		31	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00		27	27	-	1.5	47.3	51.2	-	-	-	63.9	21.3	42.6	-	-	-	-	-	-	-	-	-
	34.50		30	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.00		41	41	-	1.7	52.5	45.8	-	-	-	61.3	21.1	40.2	-	-	-	-	-	-	-	-	-
	37.50		38	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.00		49	49	-	9.5	61.8	28.7	-	-	-	45.0	21.5	23.5	-	-	-	-	-	-	-	-	-
	40.50	39.30m Dense / very dense brownish yellow silty sand	84	31	-	71.3	*28.7		22.5	$2.012	1.642	-	-	-	DS_R	11	36.0	-	-	-	-	-	-
	42.00		#144	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.50		#170	53	-	81.9	*18.1		17.5	$2.070	1.762	-	-	-	DS_R	0	38.0	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/8-3

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-8	45.00	Dense / very dense brownish yellow silty sand	107	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	46.50		#150	46	3.1	82.8	*14.1		16.4	$2.059	1.769	-	-	-	DS_R	0	37.5	-	-	-	-	-	-
	48.00		#136	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50.00		#144	42	0.9	86.6	*12.5		17.0	$2.047	1.750	-	-	-	DS_R	0	37.0	-	-	-	-	-	-

Extrapolated N Values for N>100

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/8-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-10	1.50	Fill consisting of grey silty sand with stone / brick pieces etc. — 1.50m — Soft / firm grey silty clay; loose grey silty fine sand observed at 3.0m depth	-	-	0.2	2.0	65.8	32.0	34.1	1.801	1.343	50.3	22.1	28.2	UU UC UC_R	16 17 11	2.0 - -	2.68	0.3056	0.1531	0.9955	0.43	4.0×10^{-8}
	2.00		3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3.00		-	-	-	58.9	37.4	3.7	32.4	1.770	1.337	-	-	-	DS	10	28.5	2.65	-	-	-	0.64	4.1×10^{-5}
	3.50		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.50		-	-	-	1.3	74.9	23.8	29.8	1.867	1.438	43.8	20.2	23.6	UU UC UC_R	26 28 20	2.0 - -	2.67	0.3340	0.1799	0.8563	3.02	5.5×10^{-8}
	5.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6.00		-	-	-	2.4	77.6	20.0	32.4	1.844	1.393	43.5	22.7	20.8	UU UC UC_R	24 27 18	2.5 - -	2.67	0.3155	0.1646	0.9171	2.98	1.7×10^{-7}
	6.50	— 6.50m — Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed from 12.0m depth	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.50		-	-	-	1.4	63.6	35.0	51.6	1.570	1.036	73.1	32.9	40.2	UU UC UC_R	20 22 14	2.0 - -	2.58	0.6614	0.2655	1.4912	2.89	2.1×10^{-7}
	8.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	9.00		-	-	-	0.8	59.7	39.5	44.8	1.691	1.168	61.3	27.2	34.1	UU UC UC_R	16 18 12	2.5 - -	2.58	0.5506	0.2492	1.2093	0.35	1.8×10^{-7}

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/9-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-10	9.50	Soft / firm grey silty clay with varying percentage of decomposed wood; plenty of wood observed from 12.0m depth	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.50		-	-	0.1	1.5	58.0	40.4	64.5	1.510	0.918	87.0	36.2	50.8	UU UC UC_R	15 17 11	1.5 - -	2.57	0.6438	0.2300	1.7998	0.39	$1.3x10^{-7}$
	11.00		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12.00		-	-	-	2.2	65.2	32.6	85.7	1.440	0.775	130.0 **67.8	66.6 37.2	63.4 30.6	UU UC UC_R	25 27 12	1.5 - -	2.57	0.8891	0.2683	2.3142	3.00	$3.6x10^{-7}$
	12.50		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.50		-	-	-	1.2	48.1	50.7	88.5	1.456	0.772	127.1 **77.4	62.3 30.8	64.8 46.6	UU UC UC_R	24 26 12	2.0 - -	2.57	1.1612	0.3490	2.3272	2.98	$4.9x10^{-7}$
	14.00	——— 14.00m ———	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15.50	Stiff bluish grey silty clay with occasional traces of calcareous nodules	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.50		-	-	0.4	9.1	52.5	38.0	26.2	1.930	1.529	53.1	18.5	34.6	UU UC UC_R	48 52 40	1.5 - -	2.69	0.3121	0.1774	0.7590	3.39	$2.2x10^{-8}$
	17.00		16	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	18.50		13	13	-	1.0	74.0	25.0	-	-	-	43.3	21.1	22.2	-	-	-	-	-	-	-	-	-
	19.50	——— 19.50m ———	-	-	-	4.0	81.0	15.0	21.5	2.018	1.661	31.8	18.8	13.0	UU UC UC_R	102 108 72	4.0 - -	2.67	0.1949	0.1212	0.6075	4.02	$4.2x10^{-7}$
	20.00	Very stiff / hard yellowish grey silty clay with high silt content to medium dense yellowish grey clayey sandy silt	31	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	21.50		31	20	1.3	40.2	52.0	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	0.76	-

*Combined percentage of silt & clay

**LL & PL conducted on oven dried sample

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/9-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-10		22.00m																					
	23.00	Medium dense yellowish grey silty sand	35	21	1.1	69.6	*29.3		24.7	$1.925	1.544	-	-	-	DS_R	8	33.0	2.65	-	-	-	0.90	-
	24.50		40	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26.00		37	21	-	73.0	*27.0		24.0	$1.932	1.558	-	-	-	DS_R	5	33.5	-	-	-	-	0.76	-
	27.00	27.00m	-	-	-	0.4	64.6	35.0	26.4	1.964	1.554	51.2	20.5	30.7	UU UC UC_R	76 84 63	2.0 - -	2.69	0.2784	0.1608	0.7312	3.74	$3.5x10^{-8}$
	27.50	Very stiff to hard bluish grey to yellowish brown silty clay to sandy silty clay	19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29.00		27	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		-	-	-	11.8	64.7	23.5	23.6	2.006	1.623	41.1	19.1	22.0	UU UC UC_R	102 114 71	3.0 - -	2.68	0.2161	0.1309	0.6513	4.02	$6.0x10^{-8}$
	30.50		41	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32.00		35	35	-	1.3	58.7	40.0	-	-	-	56.9	18.5	38.4	-	-	-	-	-	-	-	-	-
	33.50		38	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	35.00		35	35	-	9.4	67.6	23.0	-	-	-	40.0	18.1	21.9	-	-	-	-	-	-	-	-	-
	36.50		51	51	-	41.7	42.0	16.3	-	-	-	36.2	17.6	18.6	-	-	-	-	-	-	-	-	-
	38.00		83	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.50		41	41	0.1	19.6	57.0	23.3	-	-	-	42.8	17.5	25.3	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

$ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/9-3

CONSTELL
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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-10	41.00	Very stiff to hard bluish grey to yellowish brown silty clay to sandy silty clay	44	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	42.50		45	45	-	38.5	42.5	19.0	-	-	-	37.1	19.7	17.4	-	-	-	-	-	-	-	-	-
	44.00		41	41	-	35.5	46.0	18.5	-	-	-	36.6	20.0	16.6	-	-	-	-	-	-	-	-	-
		45.00m																					
	45.50	Dense / very dense brownish yellow to yellowish grey silty sand	#410	112	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	47.00		#189	54	-	86.0	*14.0		18.4	$2.073	1.751	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	48.50		#237	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	50.00		#192	53	0.1	87.8	*12.1		18.0	$2.064	1.749	-	-	-	DS_R	0	37.5	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/9-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis: Gravel (%)	Grain Size Analysis: Sand (%)	Grain Size Analysis: Silt (%)	Grain Size Analysis: Clay (%)	Density and Moisture Test: Natural Moisture Content (%)	Density and Moisture Test: Bulk Density (gms/cc)	Density and Moisture Test: Dry Density (gms/cc)	Atterberg Limits: Liquid Limit (%)	Atterberg Limits: Plastic Limit (%)	Atterberg Limits: Plasticity Index (%)	Shear Strength Parameters: Type of Test	Shear Strength Parameters: C (kPa)	Shear Strength Parameters: ϕ (degrees)	Specific Gravity G_s	Consolidation Characteristics: C_c	Consolidation Characteristics: $\frac{C_c}{1+e_0}$	Consolidation Characteristics: Void Ratio, e_0	Silt Factor	Permeability (cm/sec)
BH-11		Fill consisting of grey sand with stone / brick pieces etc.																					
		0.80m																					
	1.00	Soft grey sandy silty clay; very loose to loose grey clayey sandy silt to silty fine sand observed from 4.5m depth	-	-	0.3	30.5	57.4	11.8	28.3	1.827	1.424	33.9	21.9	12.0	UU UC UC_R	18 20 14	3.5 - -	2.67	0.2261	0.1206	0.8750	0.71	6.1×10^{-7}
	1.50		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2.50		-	-	1.4	27.5	56.1	15.0	31.2	1.814	1.383	34.6	22.6	12.0	UU UC UC_R	16 15 8	3.0 - -	2.66	0.2300	0.1195	0.9239	0.81	7.8×10^{-7}
	3.00		2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4.00		-	-	0.5	29.7	55.0	14.8	31.6	1.805	1.372	34.9	23.4	11.5	UU UC UC_R	11 14 8	2.5 - -	2.66	0.2409	0.1242	0.9394	0.65	2.1×10^{-6}
	4.50		2	2	1.7	45.0	44.2	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.95	-
	6.00		6	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7.00		-	-	-	53.5	42.0	4.5	31.9	1.760	1.334	-	-	-	DS	10	26.0	2.65	-	-	-	0.63	5.0×10^{-5}
	7.50	7.50m	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8.50	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood	-	-	-	1.1	75.9	23.0	43.1	1.705	1.191	52.2	26.4	25.8	UU UC UC_R	23 26 16	3.0 - -	2.60	0.4129	0.1892	1.1822	2.96	3.1×10^{-7}

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/10-1

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-11	9.00	Soft / firm grey silty clay / clayey silt with varying percentage of decomposed wood	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10.00		-	-	-	1.1	63.0	35.9	60.3	1.526	0.952	74.0	34.7	39.3	UU UC UC_R	15 18 10	1.5 - -	2.59	0.6042	0.2221	1.7207	0.36	$1.6x10^{-7}$
	10.50		6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	11.50		-	-	-	0.6	74.6	24.8	45.6	1.699	1.167	55.6	30.2	25.4	UU UC UC_R	22 25 12	2.0 - -	2.58	0.4498	0.2034	1.2110	2.94	$4.2x10^{-7}$
	12.00		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13.50		5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14.50	14.50m Stiff bluish grey silty clay with occasional traces of calcareous nodules	-	-	0.4	3.4	51.2	45.0	29.6	1.897	1.464	68.2	20.5	47.7	UU UC UC_R	38 42 31	2.0 - -	2.68	0.3032	0.1656	0.8309	3.23	$2.1x10^{-8}$
	15.00		8	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16.50		13	13	8.3	7.2	38.8	45.7	-	-	-	65.0	20.0	45.0	-	-	-	-	-	-	-	-	-
	17.50		-	-	-	0.5	67.5	32.0	27.7	1.930	1.511	50.0	20.4	29.6	UU UC UC_R	56 63 40	3.0 - -	2.68	0.2872	0.1620	0.7732	3.50	$2.6x10^{-8}$
	18.00	18.00m Very stiff greyish yellow silty clay with high silt content to medium dense clayey sandy silt	17	17	-	8.0	79.0	13.0	-	-	-	31.8	20.3	11.5	-	-	-	-	-	-	-	-	-
	19.50		17	14	-	29.2	64.2	6.6	-	-	-	28.7	22.3	6.4	-	-	-	-	-	-	-	-	-
	21.00		36	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Combined percentage of silt & clay

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/10-2

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-11	22.50	22.50m	57	30	0.9	51.2	43.9	4.0	20.8	$2.011	1.665	-	-	-	DS_R	15	34.5	-	-	-	-	0.74	-
	24.00	Medium dense / dense greyish yellow silty sand	39	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25.50		61	30	-	67.9	*32.1		19.2	$2.031	1.704	-	-	-	DS_R	11	35.0	-	-	-	-	0.73	-
	27.00	27.00m	13	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	28.00	Stiff to very stiff / hard bluish grey to brownish yellow silty clay to sandy silty clay	-	-	-	1.4	50.0	48.6	26.6	1.936	1.529	68.2	20.7	47.5	UU UC UC_R	56 61 46	1.5 - -	2.68	0.2619	0.1495	0.7525	3.50	$1.7x10^{-8}$
	28.50		19	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30.00		21	21	-	2.8	56.1	41.1	-	-	-	57.7	19.4	38.3	-	-	-	-	-	-	-	-	-
	31.00		-	-	-	1.0	59.8	39.2	24.7	1.967	1.577	55.0	19.0	36.0	UU UC UC_R	91 95 73	2.0 - -	2.69	0.2508	0.1471	0.7054	-	$7.1x10^{-9}$
	31.50		20	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	33.00		32	32	-	1.9	61.1	37.0	-	-	-	53.1	18.4	34.7	-	-	-	-	-	-	-	-	-
	34.50		33	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	36.00		33	33	-	2.7	67.3	30.0	-	-	-	45.4	18.3	27.1	-	-	-	-	-	-	-	-	-
	37.50		40	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.00		44	44	0.3	44.6	38.3	16.8	-	-	-	37.3	18.7	18.6	-	-	-	-	-	-	-	-	-
	40.50		#535	535	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test (iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock

JOB NO.: CCPL/20101211

TABLE NO.: C/10-3

CONSTELL CONSULTANTS PVT. LTD.

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Bore Hole Number	Depth below G.L. in 'm'	Description	Standard Penetration Resistance 'N' Value	Corrected 'N' Value	Grain Size Analysis				Density and Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s	Consolidation Characteristics			Silt Factor	Permeability (cm/sec)
					Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kPa)	ϕ (degrees)		C_c	$\frac{C_c}{1+e_0}$	Void Ratio, e_0		
BH-11	42.00	Stiff to very stiff / hard bluish grey to brownish yellow silty clay to sandy silty clay	85	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	43.50		104	104	-	24.0	52.0	24.0	-	-	-	43.5	20.9	22.6	-	-	-	-	-	-	-	-	-
	45.00	———— 45.00m ————	#160	49	1.8	80.9	*17.3		20.6	$2.060	1.708	-	-	-	DS_R	0	37.0	-	-	-	-	-	-
	46.50	Dense / very dense brownish yellow silty sand	#525	140	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48.00		108	34	1.2	76.2	*22.6		20.3	$2.031	1.688	-	-	-	DS_R	8	36.5	-	-	-	-	-	-
	50.00		#200	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Extrapolated N Values for N>100 *Combined percentage of silt & clay $ Remoulded density

Abbreviations used : (i) UU = Unconsolidated Undrained Triaxial Test (ii) UC = Unconfined Compressive Strength (iii) DS = Direct Shear test
(iv) UC_R = Unconfined Compressive Strength on Remoulded sample (v) DS_R = Direct Shear Test on Remoulded sample

Bore hole data and Laboratory test results for the upgradation of Berth No.7, NSD, N.S.Dock	**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/10-4

CONSTELL
CONSULTANTS PVT. LTD.

Bore Hole No.	Depth (m)	Description	Standard Proctor Test (Light Compaction)		Modified Proctor Test (Heavy Compaction)	
			Maximum Dry Density (gms/cc)	O.M.C. (%)	Maximum Dry Density (gms/cc)	O.M.C. (%)
BH-5	1.00	Grey silty clay	1.664	19.5	1.850	14.0
BH-5	2.50	Yellowish grey fine sand	1.690	15.5	1.810	12.0
BH-6	3.00	Grey sandy silt / silty sand	1.751	16.0	1.872	12.4
BH-7	2.50	Grey silty clay	1.650	20.0	1.838	14.4
BH-8	1.00	Grey silty clay	1.700	18.4	1.870	13.4
BH-8	2.50	Grey silty fine sand with traces of clay	1.736	15.7	1.845	12.2
BH-10	1.50	Grey silty clay	1.680	19.0	1.860	13.6
BH-10	3.00	Grey silty fine sand with traces of clay	1.740	14.6	1.858	11.0
BH-11	1.00	Grey sandy silty clay	1.726	17.7	1.907	12.4
BH-11	2.50	Grey sandy silty clay	1.720	18.1	1.900	13.0

Laboratory Test Results of Disturbed samples	**TABLE NO.:** C/11

Bore Hole No.	Depth (m)	pH	Total Soluble Sulphate (%)	Calcium Carbonate (%)
BH-1	2.00	7.22 (at 22°C)	0.0004	0.80
BH-1	3.50	6.77 (at 22°C)	0.001	0.17
BH-1	5.00	7.01 (at 22°C)	0.036	0.71
BH-1	6.50	6.89 (at 22°C)	0.118	0.18
BH-1	8.00	7.36 (at 22°C)	0.023	0.85
BH-1	9.50	7.10 (at 22°C)	0.058	0.47
BH-1	11.00	7.56 (at 22°C)	0.002	0.91
BH-1	14.00	7.75 (at 22°C)	0.001	1.00
BH-1	17.00	7.40 (at 22°C)	0.001	0.85
BH-1	19.00	7.86 (at 22°C)	0.002	3.60
BH-1	26.00	7.77 (at 22°C)	0.002	2.50
BH-1	29.00	7.83 (at 22°C)	0.002	3.50
BH-2	0.00	6.90 (at 22°C)	0.006	0.21
BH-2	3.00	7.02 (at 22°C)	0.002	0.54
BH-2	6.00	6.86 (at 22°C)	0.018	0.25
BH-2	9.00	7.26 (at 22°C)	0.007	0.83
BH-2	12.00	8.05 (at 22°C)	0.002	8.02
BH-2	15.00	7.08 (at 22°C)	0.002	0.29
BH-2	18.50	7.70 (at 22°C)	0.003	0.89
BH-2	25.50	7.22 (at 22°C)	0.005	0.72
BH-2	27.00	7.98 (at 22°C)	0.006	3.00
BH-2	30.00	7.47 (at 22°C)	0.002	0.58
BH-2	35.00	7.26 (at 22°C)	0.003	0.41
BH-2	41.00	7.28 (at 22°C)	0.003	0.32
Laboratory Test Results of Chemical Analysis of Soil Samples			**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/12-1

Bore Hole No.	Depth (m)	pH	Total Soluble Sulphate (%)	Calcium Carbonate (%)
BH-3	2.50	6.48 (at 22°C)	0.092	0.12
BH-3	4.00	7.22 (at 22°C)	0.004	0.70
BH-3	5.50	6.09 (at 22°C)	0.106	0.10
BH-3	7.00	6.65 (at 22°C)	0.034	0.14
BH-3	8.50	6.82 (at 22°C)	0.009	0.20
BH-3	10.00	7.06 (at 22°C)	0.009	0.41
BH-3	13.00	8.06 (at 22°C)	0.003	8.52
BH-3	16.00	7.56 (at 22°C)	0.003	0.90
BH-3	25.00	7.58 (at 22°C)	0.004	0.90
BH-3	28.00	7.87 (at 22°C)	0.005	2.90
BH-3	40.50	7.62 (at 22°C)	0.003	0.85
BH-3	45.00	7.43 (at 22°C)	0.003	0.80
BH-4	0.50	7.21 (at 22°C)	0.003	0.80
BH-4	2.00	7.07 (at 22°C)	0.002	0.45
BH-4	3.50	6.71 (at 22°C)	0.323	0.12
BH-4	5.00	6.82 (at 22°C)	0.034	0.15
BH-4	6.50	6.55 (at 22°C)	0.375	0.13
BH-4	8.00	6.97 (at 22°C)	0.006	0.18
BH-4	9.50	6.18 (at 22°C)	0.501	ND
BH-4	11.00	6.01 (at 22°C)	0.159	ND
BH-4	14.00	7.31 (at 22°C)	0.005	0.67
BH-4	17.00	7.23 (at 22°C)	0.008	0.64
BH-4	20.50	7.29 (at 22°C)	0.009	0.66
BH-4	26.00	7.00 (at 22°C)	0.004	0.61
N.D = Not Detectable				
Laboratory Test Results of Chemical Analysis of Soil Samples			**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/12-2

Bore Hole No.	Depth (m)	pH	Total Soluble Sulphate (%)	Calcium Carbonate (%)
BH-5	1.00	7.91 (at 21°C)	0.029	3.08
BH-5	2.50	7.46 (at 21°C)	0.002	0.80
BH-5	4.00	7.29 (at 21°C)	0.002	0.50
BH-5	5.50	7.38 (at 21°C)	0.045	0.55
BH-5	7.00	7.07 (at 21°C)	0.117	0.38
BH-5	8.50	7.02 (at 21°C)	0.014	0.31
BH-5	10.00	6.90 (at 21°C)	0.004	0.17
BH-5	13.00	7.71 (at 21°C)	0.002	0.99
BH-5	16.00	7.73 (at 21°C)	0.001	0.89
BH-5	22.50	7.09 (at 21°C)	0.014	0.51
BH-5	29.50	7.22 (at 21°C)	0.001	0.60
BH-5	32.50	7.56 (at 21°C)	0.004	0.71
BH-6	3.00	7.42 (at 21°C)	0.002	0.99
BH-6	4.50	7.45 (at 21°C)	0.005	0.98
BH-6	6.00	7.37 (at 21°C)	0.001	0.85
BH-6	7.50	7.21 (at 21°C)	0.015	0.77
BH-6	9.00	6.43 (at 21°C)	0.133	0.11
BH-6	10.50	7.08 (at 21°C)	0.015	0.59
BH-6	13.50	6.69 (at 21°C)	0.261	0.13
BH-6	16.50	8.13 (at 21°C)	0.019	8.74
BH-6	21.50	7.74 (at 21°C)	0.004	1.00
BH-6	27.00	8.08 (at 21°C)	0.069	7.82
BH-6	30.00	7.68 (at 21°C)	0.009	0.90
BH-6	38.00	7.44 (at 21°C)	0.002	0.60
Laboratory Test Results of Chemical Analysis of Soil Samples			**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/12-3

Bore Hole No.	Depth (m)	pH	Total Soluble Sulphate (%)	Calcium Carbonate (%)
BH-7	1.00	7.04 (at 21°C)	0.078	0.58
BH-7	2.50	7.32 (at 21°C)	0.062	0.72
BH-7	4.00	7.35 (at 21°C)	0.002	0.71
BH-7	5.50	6.25 (at 21°C)	0.171	ND
BH-7	7.00	6.51 (at 21°C)	0.047	0.11
BH-7	8.50	7.07 (at 21°C)	0.004	0.39
BH-7	10.00	7.41 (at 21°C)	0.011	0.49
BH-7	13.00	6.49 (at 21°C)	0.304	0.11
BH-7	16.00	7.93 (at 21°C)	0.004	2.10
BH-7	28.00	7.64 (at 21°C)	0.007	1.10
BH-7	31.00	7.50 (at 21°C)	0.004	1.00
BH-7	42.00	7.45 (at 21°C)	0.005	1.00
BH-8	1.00	7.01 (at 21°C)	0.009	0.48
BH-8	2.50	6.82 (at 21°C)	0.005	0.14
BH-8	4.00	6.81 (at 21°C)	0.021	0.14
BH-8	5.50	6.86 (at 21°C)	0.005	0.15
BH-8	7.00	6.88 (at 21°C)	0.006	0.14
BH-8	8.50	6.82 (at 21°C)	0.005	0.13
BH-8	10.00	6.78 (at 21°C)	0.020	0.11
BH-8	13.00	6.93 (at 21°C)	0.130	0.18
BH-8	16.00	8.04 (at 21°C)	0.004	8.51
BH-8	24.00	8.02 (at 21°C)	0.006	7.92
BH-8	28.00	7.86 (at 21°C)	0.005	3.88
BH-8	31.00	7.45 (at 21°C)	0.005	0.89
N.D = Not Detectable				
Laboratory Test Results of Chemical Analysis of Soil Samples			**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/12-4

Bore Hole No.	Depth (m)	pH	Total Soluble Sulphate (%)	Calcium Carbonate (%)
BH-10	3.00	7.00 (at 21°C)	0.009	0.77
BH-10	4.50	7.44 (at 21°C)	0.008	0.85
BH-10	6.00	7.98 (at 21°C)	0.007	3.92
BH-10	7.50	7.88 (at 21°C)	0.018	3.52
BH-10	9.00	7.46 (at 21°C)	0.037	0.92
BH-10	10.50	6.98 (at 21°C)	0.149	0.13
BH-10	12.00	7.26 (at 21°C)	0.025	0.81
BH-10	13.50	6.45 (at 21°C)	0.144	0.11
BH-10	16.50	8.15 (at 21°C)	0.006	8.75
BH-10	19.50	8.09 (at 21°C)	0.008	8.55
BH-10	27.00	8.22 (at 21°C)	0.006	9.21
BH-10	30.00	7.68 (at 21°C)	0.007	1.00
BH-11	1.00	7.55 (at 21°C)	0.013	0.92
BH-11	2.50	7.46 (at 21°C)	0.009	0.49
BH-11	4.00	7.23 (at 21°C)	0.007	0.40
BH-11	7.00	7.20 (at 21°C)	0.007	0.32
BH-11	8.50	6.96 (at 21°C)	0.008	0.16
BH-11	10.00	6.10 (at 21°C)	0.111	ND
BH-11	11.50	6.56 (at 21°C)	0.070	0.11
BH-11	14.50	7.61 (at 21°C)	0.031	0.97
BH-11	17.50	7.63 (at 21°C)	0.011	0.95
BH-11	28.00	7.20 (at 21°C)	0.013	0.39
BH-11	33.00	7.05 (at 21°C)	0.009	0.25
BH-11	39.00	6.96 (at 21°C)	0.013	0.19
N.D = Not Detectable				
Laboratory Test Results of Chemical Analysis of Soil Samples			**JOB NO.:** CCPL/20101211	**TABLE NO.:** C/12-5

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Layer - I : Soft / firm sandy silty clay /silty clay
Layer - II : Very soft / soft / firm silty clay / clayey silt with varying percentage of decomposed wood
Layer - IIIA : Stiff / very stiff silty clay
Layer - IIIB : Stiff / very stiff / hard silty clay with high silt content / sandy silty clay
Layer - IV : Medium dense / dense silty sand
Layer - V : Very stiff / hard silty clay with occasional brown spots
Layer - VI : Dense / very dense silty sand

Generalised Soil Profile for the upgradation of Berth No.7, NSD, N.S.Dock

Job No.: CCPL/20101211	Scale: 1:300	Figure No.: D/1

Generalised Soil Profile for the upgradation of Berth No.7, NSD, N.S.Dock

Job No.: CCPL/20101211	Scale: 1:300	Figure No.: D/2

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Fill :	Consisting of silty sand with stone / brick pieces etc.
Layer - I :	Soft / firm silty clay
Layer - II :	Soft / firm silty clay with varying percentage of decomposed wood
Layer - IIIA :	Stiff silty clay with occasional traces of calcareous nodules
Layer - IIIB :	Medium dense sandy silt with traces of clay / stiff / very stiff / hard silty clay with high silt content
Layer - IV :	Medium dense / dense / very dense silty sand
Layer - V :	Very stiff to hard silty clay with occasional yellow / brown spots
Layer - VI :	Dense / very dense silty sand / medium to fine sand

Generalised Soil Profile for the upgradation of Berth No.7, NSD, N.S.Dock

Job No.: CCPL/20101211	Scale: 1:300	Figure No.: D/3

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Fill :	Consisting of silty sand / sand with stone / brick pieces etc.
Layer - I :	Soft / firm silty clay / sandy silty clay
Layer - II :	Soft / firm silty clay / clayey silt with varying percentage of decomposed wood
Layer - IIIA :	Stiff silty clay with occasional traces of calcareous nodules
Layer - IIIB :	Very stiff / hard silty clay with high silt content to medium dense clayey sandy silt
Layer - IV :	Medium dense / dense silty sand
Layer - V :	Stiff / very stiff to hard silty clay to sandy silty clay
Layer - VI :	Dense / very dense silty sand

Generalised Soil Profile for the upgradation of Berth No.7, NSD, N.S.Dock

Job No.: CCPL/20101211	Scale: 1:300	Figure No.: D/4

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 0.50m	18.5	53.9	27.0	0.6	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 2.00m	23.6	52.5	23.4	0.1	0.4	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 3.50m	22.5	76.9	0.5	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/1

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 5.00m	25.5	72.9	1.5	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 6.50m	29.7	64.2	2.8	2.6	0.7	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 8.00m	31.8	67.4	0.7	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/2

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 9.50m	30.1	68.8	0.9	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 11.00m	33.7	63.3	2.7	0.1	0.0	0.2

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-1, 11.50m	42.0	54.7	2.7	0.5	0.1	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/3

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 14.00m	44.9	53.8	0.4	0.5	0.4	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 17.00m	24.9	74.4	0.7	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 17.50m	13.6	56.9	12.9	1.4	0.6	14.6

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/4

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 19.00m	16.7	66.4	10.5	3.4	1.1	1.9

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 22.00m	*27.5		70.6	1.9	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 26.00m	34.0	65.2	0.7	0.1	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/5

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 29.00m	33.9	64.9	0.7	0.5	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 31.00m	40.8	53.2	2.6	2.1	1.0	0.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 34.00m	30.2	67.6	1.5	0.7	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/6

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 37.00m	*23.6		46.5	29.2	0.6	0.1

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 38.50m	13.6	21.6	44.2	19.6	1.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 41.50m	*12.9		75.6	11.5	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/7

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 44.50m	*21.9		70.0	8.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-1, 48.00m	13.8	30.3	54.7	1.2	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 0.00m	*32.3		67.1	0.4	0.2	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/8

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 3.00m	35.5	64.2	0.3	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 5.00m	30.1	69.2	0.5	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 6.00m	31.5	68.4	0.1	0.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/9

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 8.00m	42.4	57.5	0.1	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 9.00m	29.8	69.1	1.1	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 11.00m	49.5	45.8	4.3	0.4	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/10

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 12.00m	45.9	46.1	2.6	4.7	0.7	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 14.00m	41.0	58.8	0.2	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 15.00m	22.9	75.6	1.5	0.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/11

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 17.00m	15.4	75.8	8.7	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 18.50m	*30.9		69.0	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 21.50m	15.0	73.3	7.9	0.1	0.0	3.7

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/12

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 24.50m	*23.1		73.5	2.2	0.1	1.1

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 25.50m	48.1	51.8	0.1	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 27.00m	35.9	55.9	2.1	2.8	0.6	2.7

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/13

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 30.00m	41.7	56.7	1.3	0.2	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 32.00m	41.7	57.1	1.1	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-2, 35.00m	24.0	70.5	3.9	1.6	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/14

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 38.00m	*17.8		59.9	19.6	1.7	1.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 41.00m	*12.8		38.0	40.8	6.4	2.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 44.00m	*12.0		69.5	18.0	0.2	0.3

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/15

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-2, 48.50m	*13.5		78.0	6.8	0.2	1.5

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-3, 1.00m	46.3	53.2	0.5	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-3, 2.50m	37.8	61.2	0.9	0.1	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/16

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 4.00m	26.0	72.2	1.4	0.2	0.2	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 5.50m	28.0	71.3	0.6	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 7.00m	38.9	60.8	0.2	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/17

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-3, 8.50m	31.7	67.9	0.4	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-3, 10.00m	35.2	63.8	0.8	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-3, 13.00m	45.7	53.2	1.0	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/18

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 16.00m	30.2	69.6	0.1	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 18.00m	9.2	74.7	15.8	0.1	0.2	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 21.00m	15.5	61.5	22.8	0.1	0.1	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/19

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 22.50m	*45.4		53.9	0.0	0.4	0.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 25.00m	47.2	52.4	0.4	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 28.00m	49.6	47.3	2.3	0.8	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/20

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 30.00m	45.5	53.6	0.8	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 33.00m	45.9	52.4	1.5	0.2	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 36.00m	22.5	62.1	9.1	6.1	0.2	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/21

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 37.50m	*19.0		61.1	18.0	1.9	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 40.50m	*21.0		43.0	31.0	3.3	1.7

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 43.50m	26.2	58.7	13.2	1.9	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/22

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 45.00m	*26.0		47.5	23.5	1.7	1.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-3, 48.00m	*12.7		41.3	45.0	1.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-4, 0.50m	31.0	68.3	0.4	0.3	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/23

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 2.00m	15.3	83.9	0.5	0.3	0.0	0.0

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 3.50m	31.6	42.0	17.9	8.0	0.5	0.0

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 5.00m	25.3	73.5	1.0	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/24

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 6.50m	38.6	58.5	1.7	1.1	0.1	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 8.00m	29.7	68.3	1.1	0.7	0.2	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 9.50m	36.8	61.2	1.7	0.3	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/25

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 11.00m	25.0	73.2	1.7	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 11.50m	28.0	70.0	1.9	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 14.00m	38.6	60.9	0.4	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/26

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 17.00m	9.4	84.3	6.1	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 17.50m	*35.4		63.8	0.8	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 20.50m	*28.2		71.8	0.0	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/27

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 23.50m	*16.5		81.7	0.0	0.2	1.6

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 25.00m	48.8	50.9	0.3	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 26.00m	56.5	40.3	2.8	0.4	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/28

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 28.00m	45.4	48.0	2.1	2.8	1.7	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 31.00m	38.8	54.8	4.2	2.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 32.50m	24.0	67.0	8.8	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/29

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-4, 34.00m	21.0	64.7	14.2	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-4, 37.00m	*20.3		53.8	15.4	6.4	4.1

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-4, 40.00m	*46.8		41.5	10.5	1.2	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/30

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 43.00m	*18.0		31.7	48.3	2.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-4, 48.00m	*40.5		48.9	3.9	3.7	3.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 1.00m	34.0	65.3	0.6	0.1	0.0	0.0

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Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/31

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 2.50m	*6.1		93.7	0.2	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 4.00m	18.0	81.3	0.6	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 5.50m	39.3	60.3	0.3	0.1	0.0	0.0

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Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/32

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 7.00m	39.3	59.4	0.9	0.4	0.0	0.0

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 8.50m	27.2	72.3	0.4	0.1	0.0	0.0

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 10.00m	28.8	70.7	0.3	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/33

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 13.00m	30.3	67.3	2.0	0.3	0.1	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 15.00m	39.5	44.2	1.8	5.1	4.0	5.4

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 16.00m	28.7	70.7	0.4	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/34

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 18.00m	29.5	70.0	0.4	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 21.00m	8.0	72.9	16.9	1.1	0.7	0.4

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 22.50m	4.1	56.8	38.2	0.9	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/35

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 24.00m	*25.0		72.0	2.0	1.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 27.00m	*26.0		66.2	0.6	1.0	6.2

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 28.50m	51.1	47.7	1.1	0.1	0.0	0.0

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Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/36

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 29.50m	49.5	47.8	2.4	0.3	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 32.50m	49.8	45.5	0.6	1.0	1.4	1.7

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-5, 34.50m	44.9	53.8	1.1	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/37

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 37.50m	24.4	65.8	9.4	0.3	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 40.50m	*12.9		37.7	46.6	2.3	0.5

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 42.00m	*18.0		63.0	18.0	1.0	0.0

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Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/38

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 45.00m	27.8	53.2	16.7	2.3	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-5, 48.00m	*12.8		39.4	44.7	2.7	0.4

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 1.50m	*43.1		29.7	9.4	4.7	13.1

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/39

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 3.00m	9.4	40.0	48.4	1.9	0.3	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 4.50m	43.2	55.3	1.4	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 6.00m	23.0	76.7	0.3	0.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/40

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 7.50m	34.8	64.7	0.4	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 9.00m	34.0	65.5	0.4	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 10.50m	25.3	74.2	0.5	0.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/41

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 13.50m	43.3	52.0	3.9	0.8	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 15.50m	52.4	41.8	5.3	0.5	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 16.50m	41.3	45.0	2.7	5.4	1.4	4.2

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/42

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 18.50m	28.7	70.6	0.6	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 21.50m	4.5	53.6	38.9	2.8	0.1	0.1

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 23.00m	12.8	73.4	12.8	0.4	0.6	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/43

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 24.50m	*25.2		72.4	2.2	0.2	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 27.00m	49.5	48.1	1.9	0.5	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 30.00m	47.2	49.3	2.7	0.8	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/44

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 33.50m	36.7	52.1	3.0	5.8	2.4	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 36.50m	22.8	63.3	13.0	0.9	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 38.00m	14.4	36.2	47.4	2.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/45

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 41.00m	*14.6		56.6	27.7	0.8	0.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 44.00m	25.5	44.3	26.0	4.0	0.2	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-6, 45.50m	*12.9		72.5	14.6	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/46

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-6, 48.50m	*18.2		67.2	14.6	0.0	0.0

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 1.00m	5.9	32.8	11.1	11.9	11.4	26.9

Grain size (mm)	<0.002	0.002-0.075	0.075-0.425	0.425-2.0	2.0-4.75	>4.75
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 2.50m	40.7	49.8	9.0	0.4	0.1	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/47

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 4.00m	34.8	65.0	0.2	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 5.50m	36.7	53.0	6.0	4.2	0.1	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 7.00m	29.8	69.8	0.3	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/48

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 8.50m	28.0	71.3	0.4	0.3	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 10.00m	35.0	55.4	9.4	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 13.00m	49.7	43.2	6.1	1.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/49

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 16.00m	44.8	45.7	1.9	3.5	3.8	0.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 18.00m	33.2	66.3	0.4	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 21.00m	16.7	77.1	5.8	0.4	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/50

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 24.00m	19.0	76.1	3.3	1.6	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 25.50m	*31.4		68.5	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 28.00m	50.1	46.7	2.8	0.4	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/51

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 31.00m	47.8	49.1	2.6	0.5	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 33.00m	47.7	49.6	0.6	0.6	0.7	0.8

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-7, 36.00m	49.9	47.5	2.1	0.5	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/52

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 39.00m	20.2	74.3	3.5	1.9	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 42.00m	*4.7		57.5	37.5	0.3	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 45.00m	*4.2		58.9	36.9	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/53

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-7, 48.00m	*3.5		53.4	43.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 1.00m	25.7	73.7	0.4	0.2	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 2.50m	6.0	41.0	51.7	0.3	0.1	0.9

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/54

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 4.00m	38.0	59.9	2.0	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 5.50m	26.2	72.7	0.7	0.4	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 7.00m	41.2	58.0	0.5	0.3	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/55

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 8.50m	30.5	69.0	0.5	0.0	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 10.00m	31.0	68.1	0.6	0.3	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 13.00m	32.0	63.2	4.5	0.3	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/56

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 15.00m	47.1	49.4	2.7	0.6	0.2	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 16.00m	41.8	40.9	2.0	3.6	2.8	8.9

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 18.00m	28.1	71.4	0.5	0.0	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/57

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 21.00m	26.5	70.9	2.6	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 22.50m	8.9	66.5	20.5	2.8	0.8	0.5

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 24.00m	4.4	61.0	34.0	0.4	0.2	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/58

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 25.50m	*36.0		63.7	0.3	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 28.00m	43.0	56.2	0.7	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 31.00m	44.0	50.1	2.3	2.8	0.8	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/59

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 33.00m	51.2	47.3	1.1	0.2	0.2	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 36.00m	45.8	52.5	1.4	0.3	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-8, 39.00m	28.7	61.8	5.5	3.5	0.5	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/60

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 40.50m	*28.7		68.9	2.2	0.2	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 43.50m	*18.1		53.5	28.1	0.3	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 46.50m	*14.1		45.5	34.2	3.1	3.1

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/61

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-8, 50.00m	*12.5		48.0	36.6	2.0	0.9

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 1.50m	32.0	65.8	1.7	0.2	0.1	0.2

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 3.00m	3.7	37.4	58.4	0.4	0.1	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/62

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 4.50m	23.8	74.9	1.2	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 6.00m	20.0	77.6	2.4	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 7.50m	35.0	63.6	1.1	0.3	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/63

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 9.00m	39.5	59.7	0.8	0.0	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 10.50m	40.4	58.0	1.2	0.3	0.0	0.1

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 12.00m	32.6	65.2	2.0	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/64

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 13.50m	50.7	48.1	0.9	0.3	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 16.50m	38.0	52.5	2.2	3.9	3.0	0.4

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 18.50m	25.0	74.0	0.9	0.1	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/65

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 19.50m	15.0	81.0	3.6	0.3	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 21.50m	6.5	52.0	39.7	0.2	0.3	1.3

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 23.00m	*29.3		67.7	1.4	0.5	1.1

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/66

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 26.00m	*27.0		70.4	2.0	0.6	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 27.00m	35.0	64.6	0.3	0.1	0.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 30.00m	23.5	64.7	11.1	0.7	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/67

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 32.00m	40.0	58.7	1.2	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 35.00m	23.0	67.6	9.2	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 36.50m	16.3	42.0	40.5	1.0	0.2	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/68

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 39.50m	23.3	57.0	16.2	3.0	0.4	0.1

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 42.50m	19.0	42.5	24.5	13.2	0.8	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-10, 44.00m	18.5	46.0	24.5	10.0	1.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/69

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 47.00m	*14.0		41.0	42.0	3.0	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-10, 50.00m	*12.1		25.7	58.4	3.7	0.1

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 1.00m	11.8	57.4	27.6	1.7	1.2	0.3

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/70

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 2.50m	15.0	56.1	25.6	1.2	0.7	1.4

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 4.00m	14.8	55.0	28.7	0.4	0.6	0.5

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 4.50m	9.1	44.2	41.1	2.0	1.9	1.7

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/71

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 7.00m	4.5	42.0	52.1	1.2	0.2	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 8.50m	23.0	75.9	0.9	0.2	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 10.00m	35.9	63.0	0.7	0.4	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/72

GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 11.50m	24.8	74.6	0.5	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 14.50m	45.0	51.2	2.0	0.5	0.9	0.4

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 16.50m	45.7	38.8	1.7	2.8	2.7	8.3

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/73

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 17.50m	32.0	67.5	0.4	0.1	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 18.00m	13.0	79.0	7.5	0.5	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 19.50m	6.6	64.2	29.0	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/74

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 22.50m	4.0	43.9	51.0	0.1	0.1	0.9

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 25.50m	*32.1		66.5	0.7	0.7	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 28.00m	48.6	50.0	1.1	0.3	0.0	0.0

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/75

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 30.00m	41.1	56.1	1.7	1.0	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 31.00m	39.2	59.8	0.8	0.1	0.1	0.0

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 33.00m	37.0	61.1	1.7	0.2	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/76

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 36.00m	30.0	67.3	2.0	0.7	0.0	0.0

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 39.00m	16.8	38.3	27.8	16.0	0.8	0.3

Grain size (mm)	*<0.002*	*0.002-0.075*	*0.075-0.425*	*0.425-2.0*	*2.0-4.75*	*>4.75*
Sample No.	**Clay (%)**	**Silt (%)**	**Fine sand (%)**	**Medium sand (%)**	**Coarse sand (%)**	**Gravel (%)**
BH-11, 43.50m	24.0	52.0	14.7	9.3	0.0	0.0

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** E/77

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GRAIN SIZE DISTRIBUTION CURVES

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 45.00m	*17.3		73.0	5.9	2.0	1.8

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**
BH-11, 48.00m	*22.6		70.7	4.4	1.1	1.2

Grain size (mm) **Sample No.**	*<0.002* **Clay (%)**	*0.002-0.075* **Silt (%)**	*0.075-0.425* **Fine sand (%)**	*0.425-2.0* **Medium sand (%)**	*2.0-4.75* **Coarse sand (%)**	*>4.75* **Gravel (%)**

*Silt & Clay

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** **CCPL/20101211**	**Fig. No.** E/78

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Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 23 kPa
Depth:	0.50 m		ϕ : 3.0°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 30 kPa
Depth:	2.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 27 kPa
Depth:	3.50 m		ϕ : 4.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/1

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 22 kPa
Depth:	5.00 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 14 kPa
Depth:	6.50 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 16 kPa
Depth:	8.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/2

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 17 kPa
Depth:	9.50 m		ϕ : 3.0°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 51 kPa
Depth:	11.00 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 77 kPa
Depth:	14.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/3

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 66 kPa
Depth:	17.00 m		ϕ : 4.0°

Direct Shear Test

BH No.:	BH-1	**Test Type: DS_R**	c : 10 kPa
Depth:	22.00 m		ϕ : 36.0°

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 91 kPa
Depth:	26.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/4

Mohr-Diagram

BH No.:	BH-1	**Test Type: UU**	c : 93 kPa
Depth:	29.00 m		ϕ : 2.0°

Direct Shear Test

BH No.:	BH-1	**Test Type: DS_R**	c : 10 kPa
Depth:	37.00 m		ϕ : 38.5°

Direct Shear Test

BH No.:	BH-1	**Test Type: DS_R**	c : 0 kPa
Depth:	41.50 m		ϕ : 37.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/5

Direct Shear Test

BH No.:	BH-1	**Test Type: DS_R**	c : 0 kPa
Depth:	44.50 m		ϕ : 37.0°

Direct Shear Test

BH No.:	BH-2	**Test Type: DS**	c : 12 kPa
Depth:	0.00 m		ϕ : 26.0°

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 23 kPa
Depth:	3.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/6

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 22 kPa
Depth:	6.00 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 17 kPa
Depth:	9.00 m		ϕ : 3.0°

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 66 kPa
Depth:	12.00 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/7

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 68 kPa
Depth:	15.00 m		ϕ : 4.5°

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 18 kPa
Depth:	18.50 m		ϕ : 34.0°

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 10 kPa
Depth:	24.50 m		ϕ : 33.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/8

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 75 kPa
Depth:	25.50 m		ϕ : 3.5°

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 109 kPa
Depth:	27.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-2	**Test Type: UU**	c : 137 kPa
Depth:	30.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/9

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 0 kPa
Depth:	38.00 m		ϕ : 38.0°

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 0 kPa
Depth:	41.00 m		ϕ : 36.5°

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 0 kPa
Depth:	44.00 m		ϕ : 37.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/10

Direct Shear Test

BH No.:	BH-2	**Test Type: DS_R**	c : 0 kPa
Depth:	48.50 m		ϕ : 37.0°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 13 kPa
Depth:	1.00 m		ϕ : 1.0°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 14 kPa
Depth:	2.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/11

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 19 kPa
Depth:	4.00 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 12 kPa
Depth:	5.50 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 14 kPa
Depth:	7.00 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/12

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 15 kPa
Depth:	8.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 17 kPa
Depth:	10.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 39 kPa
Depth:	13.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/13

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 74 kPa
Depth:	16.00 m		ϕ : 2.5°

Direct Shear Test

BH No.:	BH-3	**Test Type: DS_R**	c : 16 kPa
Depth:	22.50 m		ϕ : 35.5°

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 108 kPa
Depth:	25.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/14

Mohr-Diagram

BH No.:	BH-3	**Test Type: UU**	c : 122 kPa
Depth:	28.00 m		ϕ : 1.5°

Direct Shear Test

BH No.:	BH-3	**Test Type: DS_R**	c : 0 kPa
Depth:	37.50 m		ϕ : 37.0°

Direct Shear Test

BH No.:	BH-3	**Test Type: DS_R**	c : 12 kPa
Depth:	40.50 m		ϕ : 35.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/15

Direct Shear Test

BH No.:	BH-3	**Test Type: DS_R**	c : 15 kPa
Depth:	45.00 m		ϕ : 36.0°

Direct Shear Test

BH No.:	BH-3	**Test Type: DS_R**	c : 0 kPa
Depth:	48.00 m		ϕ : 37.5°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 28 kPa
Depth:	0.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/16

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 29 kPa
Depth:	2.00 m		ϕ : 4.0°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 20 kPa
Depth:	3.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 22 kPa
Depth:	5.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/17

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 15 kPa
Depth:	6.50 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 16 kPa
Depth:	8.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 18 kPa
Depth:	9.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/18

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 52 kPa
Depth:	11.00 m		ϕ : 3.0°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 95 kPa
Depth:	14.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 51 kPa
Depth:	17.00 m		ϕ : 4.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/19

BH No.:	BH-4	**Test Type: DS_R**	c : 15 kPa
Depth:	17.50 m		ϕ : 32.0°

BH No.:	BH-4	**Test Type: DS_R**	c : 10 kPa
Depth:	20.50 m		ϕ : 34.0°

BH No.:	BH-4	**Test Type: DS_R**	c : 0 kPa
Depth:	23.50 m		ϕ : 36.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/20

Mohr-Diagram

BH No.:	BH-4	**Test Type: UU**	c : 72 kPa
Depth:	26.00 m		ϕ : 1.5°

Direct Shear Test

BH No.:	BH-4	**Test Type: DS_R**	c : 0 kPa
Depth:	37.00 m		ϕ : 37.0°

Direct Shear Test

BH No.:	BH-4	**Test Type: DS_R**	c : 12 kPa
Depth:	40.00 m		ϕ : 37.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/21

Direct Shear Test

BH No.:	BH-4	**Test Type: DS_R**	c : 0 kPa
Depth:	43.00 m		ϕ : 38.0°

Direct Shear Test

BH No.:	BH-4	**Test Type: DS_R**	c : 0 kPa
Depth:	48.00 m		ϕ : 36.5°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 23 kPa
Depth:	1.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/22

Direct Shear Test

BH No.:	BH-5	**Test Type: DS**	c : 0 kPa
Depth:	2.50 m		ϕ : 27.0°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 22 kPa
Depth:	4.00 m		ϕ : 4.0°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 21 kPa
Depth:	5.50 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/23

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 14 kPa
Depth:	7.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 17 kPa
Depth:	8.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 15 kPa
Depth:	10.00 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/24

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 28 kPa
Depth:	13.00 m		ϕ : 3.0°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 47 kPa
Depth:	16.00 m		ϕ : 2.0°

Direct Shear Test

BH No.:	BH-5	**Test Type: DS_R**	c : 10 kPa
Depth:	24.00 m		ϕ : 33.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/25

Direct Shear Test

BH No.:	BH-5	**Test Type: DS_R**	c : 12 kPa
Depth:	27.00 m		ϕ : 36.5°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 72 kPa
Depth:	29.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-5	**Test Type: UU**	c : 107 kPa
Depth:	32.50 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/26

Direct Shear Test

BH No.:	BH-5	**Test Type: DS_R**	c : 0 kPa
Depth:	40.50 m		ϕ : 35.0°

Direct Shear Test

BH No.:	BH-5	**Test Type: DS_R**	c : 10 kPa
Depth:	42.00 m		ϕ : 37.0°

Direct Shear Test

BH No.:	BH-5	**Test Type: DS_R**	c : 0 kPa
Depth:	48.00 m		ϕ : 35.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/27

Direct Shear Test

BH No.:	BH-6	**Test Type: DS**	c : 20 kPa
Depth:	3.00 m		ϕ : 27.5°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 12 kPa
Depth:	4.50 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 30 kPa
Depth:	6.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/28

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 21 kPa
Depth:	7.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 10 kPa
Depth:	9.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 15 kPa
Depth:	10.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/29

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 17 kPa
Depth:	13.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 57 kPa
Depth:	16.50 m		ϕ : 2.5°

Direct Shear Test

BH No.:	BH-6	**Test Type: DS_R**	c : 11 kPa
Depth:	24.50 m		ϕ : 36.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/30

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 78 kPa
Depth:	27.00 m		ϕ : 1.0°

Mohr-Diagram

BH No.:	BH-6	**Test Type: UU**	c : 92 kPa
Depth:	30.00 m		ϕ : 1.5°

Direct Shear Test

BH No.:	BH-6	**Test Type: DS_R**	c : 0 kPa
Depth:	41.00 m		ϕ : 37.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/31

Direct Shear Test

BH No.:	BH-6	**Test Type: DS_R**	c : 0 kPa
Depth:	45.50 m		ϕ : 37.5°

Direct Shear Test

BH No.:	BH-6	**Test Type: DS_R**	c : 0 kPa
Depth:	48.50 m		ϕ : 38.0°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 15 kPa
Depth:	2.50 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/32

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 14 kPa
Depth:	4.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 16 kPa
Depth:	5.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 22 kPa
Depth:	7.00 m		ϕ : 1.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/33

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 16 kPa
Depth:	8.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 17 kPa
Depth:	10.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 23 kPa
Depth:	13.00 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/34

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 69 kPa
Depth:	16.00 m		ϕ : 1.0°

Direct Shear Test

BH No.:	BH-7	**Test Type: DS_R**	c : 12 kPa
Depth:	25.50 m		ϕ : 35.0°

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 74 kPa
Depth:	28.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/35

Mohr-Diagram

BH No.:	BH-7	**Test Type: UU**	c : 94 kPa
Depth:	31.00 m		ϕ : 1.5°

Direct Shear Test

BH No.:	BH-7	**Test Type: DS_R**	c : 0 kPa
Depth:	42.00 m		ϕ : 36.5°

Direct Shear Test

BH No.:	BH-7	**Test Type: DS_R**	c : 0 kPa
Depth:	45.00 m		ϕ : 37.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/36

Direct Shear Test

BH No.:	BH-7	**Test Type: DS_R**	c : 0 kPa
Depth:	48.00 m		ϕ : 37.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 29 kPa
Depth:	1.00 m		ϕ : 3.0°

Direct Shear Test

BH No.:	BH-8	**Test Type: DS**	c : 15 kPa
Depth:	2.50 m		ϕ : 31.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/37

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 22 kPa
Depth:	4.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 21 kPa
Depth:	5.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 13 kPa
Depth:	7.00 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/38

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 14 kPa
Depth:	8.50 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 16 kPa
Depth:	10.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 20 kPa
Depth:	13.00 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/39

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 56 kPa
Depth:	16.00 m		ϕ : 2.0°

Direct Shear Test

BH No.:	BH-8	**Test Type: DS_R**	c : 10 kPa
Depth:	25.50 m		ϕ : 32.5°

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 80 kPa
Depth:	28.00 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/40

Mohr-Diagram

BH No.:	BH-8	**Test Type: UU**	c : 89 kPa
Depth:	31.00 m		ϕ : 2.5°

Direct Shear Test

BH No.:	BH-8	**Test Type: DS_R**	c : 11 kPa
Depth:	40.50 m		ϕ : 36.0°

Direct Shear Test

BH No.:	BH-8	**Test Type: DS_R**	c : 0 kPa
Depth:	43.50 m		ϕ : 38.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/41

Direct Shear Test

BH No.:	BH-8	**Test Type: DS_R**	c : 0 kPa
Depth:	46.50 m		ϕ : 37.5°

Direct Shear Test

BH No.:	BH-8	**Test Type: DS_R**	c : 0 kPa
Depth:	50.00 m		ϕ : 37.0°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 16 kPa
Depth:	1.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/42

Direct Shear Test

BH No.:	BH-10	**Test Type: DS**	c : 10 kPa
Depth:	3.00 m		ϕ : 28.5°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 26 kPa
Depth:	4.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 24 kPa
Depth:	6.00 m		ϕ : 2.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/43

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 20 kPa
Depth:	7.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 16 kPa
Depth:	9.00 m		ϕ : 2.5°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 15 kPa
Depth:	10.50 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/44

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 25 kPa
Depth:	12.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 24 kPa
Depth:	13.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 48 kPa
Depth:	16.50 m		ϕ : 1.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/45

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 102 kPa
Depth:	19.50 m		ϕ : 4.0°

Direct Shear Test

BH No.:	BH-10	**Test Type: DS_R**	c : 8 kPa
Depth:	23.00 m		ϕ : 33.0°

Direct Shear Test

BH No.:	BH-10	**Test Type: DS_R**	c : 5 kPa
Depth:	26.00 m		ϕ : 33.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/46

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 76 kPa
Depth:	27.00 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-10	**Test Type: UU**	c : 102 kPa
Depth:	30.00 m		ϕ : 3.0°

Direct Shear Test

BH No.:	BH-10	**Test Type: DS_R**	c : 0 kPa
Depth:	47.00 m		ϕ : 37.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/47

Direct Shear Test

BH No.:	BH-10	**Test Type: DS_R**	c : 0 kPa
Depth:	50.00 m		ϕ : 37.5°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 18 kPa
Depth:	1.00 m		ϕ : 3.5°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 16 kPa
Depth:	2.50 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/48

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 11 kPa
Depth:	4.00 m		ϕ : 2.5°

Direct Shear Test

BH No.:	BH-11	**Test Type: DS**	c : 10 kPa
Depth:	7.00 m		ϕ : 26.0°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 23 kPa
Depth:	8.50 m		ϕ : 3.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/49

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 15 kPa
Depth:	10.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 22 kPa
Depth:	11.50 m		ϕ : 2.0°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 38 kPa
Depth:	14.50 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/50

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 56 kPa
Depth:	17.50 m		ϕ : 3.0°

Direct Shear Test

BH No.:	BH-11	**Test Type: DS_R**	c : 15 kPa
Depth:	22.50 m		ϕ : 34.5°

Direct Shear Test

BH No.:	BH-11	**Test Type: DS_R**	c : 11 kPa
Depth:	25.50 m		ϕ : 35.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/51

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 56 kPa
Depth:	28.00 m		ϕ : 1.5°

Mohr-Diagram

BH No.:	BH-11	**Test Type: UU**	c : 91 kPa
Depth:	31.00 m		ϕ : 2.0°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/52

Direct Shear Test

BH No.:	BH-11	**Test Type: DS_R**	c : 0 kPa
Depth:	45.00 m		ϕ : 37.0°

Direct Shear Test

BH No.:	BH-11	**Test Type: DS_R**	c : 8 kPa
Depth:	48.00 m		ϕ : 36.5°

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No.** CCPL/20101211	**Fig. No.** F/53

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e-logp curve

Bore hole No.: BH-1 Depth : 2.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8251		
Effective Overburden Pressure, p_0	=	16 kPa		
Compression Index C_c	=	0.2666	25 - 50	0.000285
$C_c/(1+e_0)$	=	0.1461	50 - 100	0.000307
Pre-consolidation Pressure, p_c	=	132 kPa	100 - 200	0.000276
Swelling Index, C_s	=	0.0455	200 - 400	0.000204
Recompression Index, C_r	≈	0.0455	400 - 800	0.000102

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/1

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e-logp curve

Bore hole No.: BH-1 Depth : 3.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8892		
Effective Overburden Pressure, p_0	=	28 kPa		
Compression Index C_c	=	0.2737	25 - 50	0.000344
$C_c/(1+e_0)$	=	0.1449	50 - 100	0.000349
Pre-consolidation Pressure, p_c	=	138 kPa	100 - 200	0.000265
Swelling Index, C_s	=	0.0747	200 - 400	0.000177
Recompression Index, C_r	≈	0.0747	400 - 800	0.000101

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/2

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e-logp curve

Bore hole No.: BH-1 Depth : 5.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2155		
Effective Overburden Pressure, p_0	=	40 kPa		
Compression Index C_c	=	0.3626	25 - 50	0.000341
$C_c/(1+e_0)$	=	0.1637	50 - 100	0.000342
Pre-consolidation Pressure, p_c	=	145 kPa	100 - 200	0.000262
Swelling Index, C_s	=	0.0673	200 - 400	0.000194
Recompression Index, C_r	≈	0.0673	400 - 800	0.000107

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/3

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e-logp curve

Bore hole No.: BH-1 Depth : 6.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	2.2890		
Effective Overburden Pressure, p_0	=	49 kPa		
Compression Index C_c	=	1.1049	25 - 50	0.001103
$C_c/(1+e_0)$	=	0.3359	50 - 100	0.000812
Pre-consolidation Pressure, p_c	=	153 kPa	100 - 200	0.000452
Swelling Index, C_s	=	0.1194	200 - 400	0.000299
Recompression Index, C_r	≈	0.1194	400 - 800	0.000178

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/4

e-logp curve

Bore hole No.: BH-1 Depth : 8.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4187		
Effective Overburden Pressure, p_0	=	58 kPa		
Compression Index C_c	=	0.6916	25 - 50	0.000679
$C_c/(1+e_0)$	=	0.2859	50 - 100	0.000662
Pre-consolidation Pressure, p_c	=	156 kPa	100 - 200	0.000446
Swelling Index, C_s	=	0.0874	200 - 400	0.000275
Recompression Index, C_r	≈	0.0874	400 - 800	0.000154

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/5

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e-logp curve

Bore hole No.: BH-1 Depth : 9.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.5081		
Effective Overburden Pressure, p_0	=	67 kPa		
Compression Index C_c	=	0.7723	25 - 50	0.000546
$C_c/(1+e_0)$	=	0.3079	50 - 100	0.000573
Pre-consolidation Pressure, p_c	=	166 kPa	100 - 200	0.000442
Swelling Index, C_s	=	0.1395	200 - 400	0.000324
Recompression Index, C_r	≈	0.1395	400 - 800	0.000192

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/6

e-logp curve

Bore hole No.: BH-1 Depth : 11.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7644		
Effective Overburden Pressure, p_0	=	76 kPa		
Compression Index C_c	=	0.3008	25 - 50	0.000270
$C_c/(1+e_0)$	=	0.1705	50 - 100	0.000276
Pre-consolidation Pressure, p_c	=	174 kPa	100 - 200	0.000243
Swelling Index, C_s	=	0.0587	200 - 400	0.000196
Recompression Index, C_r	≈	0.0587	400 - 800	0.000111

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/7

e-logp curve

Bore hole No.: BH-1 Depth : 14.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7219		
Effective Overburden Pressure, p_0	=	94 kPa		
Compression Index C_c	=	0.2463	25 - 50	0.000246
$C_c/(1+e_0)$	=	0.1431	50 - 100	0.000269
Pre-consolidation Pressure, p_c	=	191 kPa	100 - 200	0.000186
Swelling Index, C_s	=	0.0571	200 - 400	0.000138
Recompression Index, C_r	≈	0.0571	400 - 800	0.000090

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/8

e-logp curve

Bore hole No.: BH-1 Depth : 17.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7344		
Effective Overburden Pressure, p_0	=	112 kPa		
Compression Index C_c	=	0.2566	25 - 50	0.000165
$C_c/(1+e_0)$	=	0.1479	50 - 100	0.000193
Pre-consolidation Pressure, p_c	=	199 kPa	100 - 200	0.000200
Swelling Index, C_s	=	0.0463	200 - 400	0.000157
Recompression Index, C_r	≈	0.0463	400 - 800	0.000094

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/9

e-logp curve

Bore hole No.: BH-1 Depth : 26.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7115		
Effective Overburden Pressure, p_0	=	201 kPa		
Compression Index C_c	=	0.2279	25 - 50	0.000149
$C_c/(1+e_0)$	=	0.1332	50 - 100	0.000146
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000143
Swelling Index, C_s	=	0.0483	200 - 400	0.000131
Recompression Index, C_r	≈	0.0483	400 - 800	0.000084

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/10

e-logp curve

Bore hole No.: BH-1 Depth : 29.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7055		
Effective Overburden Pressure, p_0	=	230 kPa		
Compression Index C_c	=	0.2374	25 - 50	0.000154
$C_c/(1+e_0)$	=	0.1392	50 - 100	0.000144
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000141
Swelling Index, C_s	=	0.0434	200 - 400	0.000134
Recompression Index, C_r	≈	0.0434	400 - 800	0.000087

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/11

e-logp curve

Bore hole No.: BH-2 Depth : 3.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9165		
Effective Overburden Pressure, p_0	=	23 kPa		
Compression Index C_c	=	0.3269	25 - 50	0.000354
$C_c/(1+e_0)$	=	0.1706	50 - 100	0.000428
Pre-consolidation Pressure, p_c	=	135 kPa	100 - 200	0.000305
Swelling Index, C_s	=	0.0619	200 - 400	0.000215
Recompression Index, C_r	≈	0.0619	400 - 800	0.000119

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/12

e-logp curve

Bore hole No.: BH-2 Depth : 6.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1495		
Effective Overburden Pressure, p_0	=	48 kPa		
Compression Index C_c	=	0.4314	25 - 50	0.000549
$C_c/(1+e_0)$	=	0.2007	50 - 100	0.000465
Pre-consolidation Pressure, p_c	=	145 kPa	100 - 200	0.000323
Swelling Index, C_s	=	0.0657	200 - 400	0.000220
Recompression Index, C_r	≈	0.0657	400 - 800	0.000126

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/13

e-logp curve

Bore hole No.: BH-2 Depth : 9.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	2.1221		
Effective Overburden Pressure, p_0	=	65 kPa		
Compression Index C_c	=	1.0496	25 - 50	0.000797
$C_c/(1+e_0)$	=	0.3362	50 - 100	0.000700
Pre-consolidation Pressure, p_c	=	157 kPa	100 - 200	0.000522
Swelling Index, C_s	=	0.2039	200 - 400	0.000360
Recompression Index, C_r	≈	0.2039	400 - 800	0.000209

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/14

e-logp curve

Bore hole No.: BH-2 Depth : 12.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7408		
Effective Overburden Pressure, p_0	=	84 kPa		
Compression Index C_c	=	0.2686	25 - 50	0.000180
$C_c/(1+e_0)$	=	0.1543	50 - 100	0.000201
Pre-consolidation Pressure, p_c	=	187 kPa	100 - 200	0.000197
Swelling Index, C_s	=	0.0465	200 - 400	0.000167
Recompression Index, C_r	≈	0.0465	400 - 800	0.000107

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/15

e-logp curve

Bore hole No.: BH-2 Depth : 15.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6997		
Effective Overburden Pressure, p_0	=	112 kPa		
Compression Index C_c	=	0.2495	25 - 50	0.000188
$C_c/(1+e_0)$	=	0.1468	50 - 100	0.000207
Pre-consolidation Pressure, p_c	=	195 kPa	100 - 200	0.000185
Swelling Index, C_s	=	0.0578	200 - 400	0.000156
Recompression Index, C_r	≈	0.0578	400 - 800	0.000092

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/16

e-logp curve

Bore hole No.: BH-2 Depth : 25.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7295		
Effective Overburden Pressure, p_0	=	216 kPa		
Compression Index C_c	=	0.2839	25 - 50	0.000250
$C_c/(1+e_0)$	=	0.1641	50 - 100	0.000231
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000220
Swelling Index, C_s	=	0.0639	200 - 400	0.000156
Recompression Index, C_r	≈	0.0639	400 - 800	0.000093

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/17

e-logp curve

Bore hole No.: BH-2 Depth : 27.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6840		
Effective Overburden Pressure, p_0	=	231 kPa		
Compression Index C_c	=	0.2171	25 - 50	0.000172
$C_c/(1+e_0)$	=	0.1289	50 - 100	0.000163
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000146
Swelling Index, C_s	=	0.0523	200 - 400	0.000114
Recompression Index, C_r	≈	0.0523	400 - 800	0.000068

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/18

e-logp curve

Bore hole No.: BH-2 Depth : 30.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6253		
Effective Overburden Pressure, p_0	=	260 kPa		
Compression Index C_c	=	0.1935	25 - 50	0.000172
$C_c/(1+e_0)$	=	0.1191	50 - 100	0.000164
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000124
Swelling Index, C_s	=	0.0458	200 - 400	0.000095
Recompression Index, C_r	≈	0.0458	400 - 800	0.000065

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/19

e-logp curve

Bore hole No.: BH-3 Depth : 2.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3613		
Effective Overburden Pressure, p_0	=	15 kPa		
Compression Index C_c	=	0.4496	25 - 50	0.000576
$C_c/(1+e_0)$	=	0.1904	50 - 100	0.000584
Pre-consolidation Pressure, p_c	=	99 kPa	100 - 200	0.000402
Swelling Index, C_s	=	0.0872	200 - 400	0.000239
Recompression Index, C_r	≈	0.0872	400 - 800	0.000128

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/20

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e-logp curve

Bore hole No.: BH-3 Depth : 4.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2211		
Effective Overburden Pressure, p_0	=	24 kPa		
Compression Index C_c	=	0.3520	25 - 50	0.000468
$C_c/(1+e_0)$	=	0.1585	50 - 100	0.000487
Pre-consolidation Pressure, p_c	=	108 kPa	100 - 200	0.000311
Swelling Index, C_s	=	0.0533	200 - 400	0.000191
Recompression Index, C_r	≈	0.0533	400 - 800	0.000107

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/21

e-logp curve

Bore hole No.: BH-3 Depth : 5.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3658		
Effective Overburden Pressure, p_0	=	33 kPa		
Compression Index C_c	=	0.5185	25 - 50	0.000757
$C_c/(1+e_0)$	=	0.2191	50 - 100	0.000580
Pre-consolidation Pressure, p_c	=	114 kPa	100 - 200	0.000431
Swelling Index, C_s	=	0.0819	200 - 400	0.000264
Recompression Index, C_r	≈	0.0819	400 - 800	0.000137

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/22

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e-logp curve

Bore hole No.: BH-3 Depth : 7.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4385		
Effective Overburden Pressure, p_0	=	42 kPa		
Compression Index C_c	=	0.6093	25 - 50	0.000646
$C_c/(1+e_0)$	=	0.2499	50 - 100	0.000699
Pre-consolidation Pressure, p_c	=	124 kPa	100 - 200	0.000462
Swelling Index, C_s	=	0.1464	200 - 400	0.000295
Recompression Index, C_r	≈	0.1464	400 - 800	0.000163

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/23

e-logp curve

Bore hole No.: BH-3 Depth : 8.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3840		
Effective Overburden Pressure, p_0	=	51 kPa		
Compression Index C_c	=	0.5685	25 - 50	0.000620
$C_c/(1+e_0)$	=	0.2385	50 - 100	0.000629
Pre-consolidation Pressure, p_c	=	129 kPa	100 - 200	0.000416
Swelling Index, C_s	=	0.0858	200 - 400	0.000268
Recompression Index, C_r	≈	0.0858	400 - 800	0.000142

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/24

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e-logp curve

Bore hole No.: BH-3 Depth : 10.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3271		
Effective Overburden Pressure, p_0	=	60 kPa		
Compression Index C_c	=	0.5624	25 - 50	0.000614
$C_c/(1+e_0)$	=	0.2417	50 - 100	0.000456
Pre-consolidation Pressure, p_c	=	135 kPa	100 - 200	0.000364
Swelling Index, C_s	=	0.0782	200 - 400	0.000269
Recompression Index, C_r	≈	0.0782	400 - 800	0.000155

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/25

e-logp curve

Bore hole No.: BH-3 Depth : 13.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8174		
Effective Overburden Pressure, p_0	=	78 kPa		
Compression Index C_c	=	0.3284	25 - 50	0.000284
$C_c/(1+e_0)$	=	0.1807	50 - 100	0.000309
Pre-consolidation Pressure, p_c	=	152 kPa	100 - 200	0.000278
Swelling Index, C_s	=	0.0677	200 - 400	0.000218
Recompression Index, C_r	≈	0.0677	400 - 800	0.000126

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/26

e-logp curve

Bore hole No.: BH-3 Depth : 16.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7393		
Effective Overburden Pressure, p_0	=	106 kPa		
Compression Index C_c	=	0.2569	25 - 50	0.000189
$C_c/(1+e_0)$	=	0.1477	50 - 100	0.000199
Pre-consolidation Pressure, p_c	=	190 kPa	100 - 200	0.000197
Swelling Index, C_s	=	0.0632	200 - 400	0.000159
Recompression Index, C_r	≈	0.0632	400 - 800	0.000096

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/27

e-logp curve

Bore hole No.: BH-3 Depth : 25.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6847		
Effective Overburden Pressure, p_0	=	195 kPa		
Compression Index C_c	=	0.2211	25 - 50	0.000162
$C_c/(1+e_0)$	=	0.1312	50 - 100	0.000147
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000159
Swelling Index, C_s	=	0.0412	200 - 400	0.000114
Recompression Index, C_r	≈	0.0412	400 - 800	0.000080

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/28

e-logp curve

Bore hole No.: BH-3 Depth : 28.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6438		
Effective Overburden Pressure, p_0	=	225 kPa		
Compression Index C_c	=	0.2092	25 - 50	0.000161
$C_c/(1+e_0)$	=	0.1273	50 - 100	0.000155
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000146
Swelling Index, C_s	=	0.0444	200 - 400	0.000131
Recompression Index, C_r	≈	0.0444	400 - 800	0.000080

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/29

e-logp curve

Bore hole No.: BH-4 Depth : 2.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8488		
Effective Overburden Pressure, p_0	=	17 kPa		
Compression Index C_c	=	0.2499	25 - 50	0.000239
$C_c/(1+e_0)$	=	0.1352	50 - 100	0.000282
Pre-consolidation Pressure, p_c	=	131 kPa	100 - 200	0.000247
Swelling Index, C_s	=	0.0246	200 - 400	0.000175
Recompression Index, C_r	≈	0.0246	400 - 800	0.000096

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/30

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e-logp curve

Bore hole No.: BH-4 Depth : 3.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	4.0530		
Effective Overburden Pressure, p_0	=	30 kPa		
Compression Index C_c	=	0.9091	25 - 50	0.000664
$C_c/(1+e_0)$	=	0.1799	50 - 100	0.000483
Pre-consolidation Pressure, p_c	=	139 kPa	100 - 200	0.000305
Swelling Index, C_s	=	0.1455	200 - 400	0.000194
Recompression Index, C_r	≈	0.1455	400 - 800	0.000111

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/31

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e-logp curve

Bore hole No.: BH-4 Depth : 5.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2633		
Effective Overburden Pressure, p_0	=	39 kPa		
Compression Index C_c	=	0.4144	25 - 50	0.000544
$C_c/(1+e_0)$	=	0.1831	50 - 100	0.000437
Pre-consolidation Pressure, p_c	=	147 kPa	100 - 200	0.000286
Swelling Index, C_s	=	0.0773	200 - 400	0.000197
Recompression Index, C_r	≈	0.0773	400 - 800	0.000111

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/32

e-logp curve

Bore hole No.: BH-4 Depth : 6.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4394		
Effective Overburden Pressure, p_0	=	48 kPa		
Compression Index C_c	=	0.6064	25 - 50	0.000690
$C_c/(1+e_0)$	=	0.2486	50 - 100	0.000581
Pre-consolidation Pressure, p_c	=	151 kPa	100 - 200	0.000427
Swelling Index, C_s	=	0.1305	200 - 400	0.000258
Recompression Index, C_r	≈	0.1305	400 - 800	0.000148

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/33

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e-logp curve

Bore hole No.: BH-4 Depth : 8.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4590		
Effective Overburden Pressure, p_0	=	57 kPa		
Compression Index C_c	=	0.6201	25 - 50	0.000650
$C_c/(1+e_0)$	=	0.2522	50 - 100	0.000576
Pre-consolidation Pressure, p_c	=	161 kPa	100 - 200	0.000378
Swelling Index, C_s	=	0.0952	200 - 400	0.000237
Recompression Index, C_r	≈	0.0952	400 - 800	0.000133

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/34

e-logp curve

Bore hole No.: BH-4 Depth : 9.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.5967		
Effective Overburden Pressure, p_0	=	66 kPa		
Compression Index C_c	=	0.5917	25 - 50	0.000446
$C_c/(1+e_0)$	=	0.2279	50 - 100	0.000532
Pre-consolidation Pressure, p_c	=	173 kPa	100 - 200	0.000350
Swelling Index, C_s	=	0.1530	200 - 400	0.000250
Recompression Index, C_r	≈	0.1530	400 - 800	0.000140

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/35

e-logp curve

Bore hole No.: BH-4 Depth : 11.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7853		
Effective Overburden Pressure, p_0	=	75 kPa		
Compression Index C_c	=	0.3109	25 - 50	0.000273
$C_c/(1+e_0)$	=	0.1741	50 - 100	0.000323
Pre-consolidation Pressure, p_c	=	181 kPa	100 - 200	0.000266
Swelling Index, C_s	=	0.0492	200 - 400	0.000177
Recompression Index, C_r	≈	0.0492	400 - 800	0.000102

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/36

e-logp curve

Bore hole No.: BH-4 Depth : 14.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7082		
Effective Overburden Pressure, p_0	=	96 kPa		
Compression Index C_c	=	0.2507	25 - 50	0.000134
$C_c/(1+e_0)$	=	0.1468	50 - 100	0.000164
Pre-consolidation Pressure, p_c	=	192 kPa	100 - 200	0.000196
Swelling Index, C_s	=	0.0566	200 - 400	0.000170
Recompression Index, C_r	≈	0.0566	400 - 800	0.000099

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/37

e-logp curve

Bore hole No.: BH-4 Depth : 17.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7179		
Effective Overburden Pressure, p_0	=	125 kPa		
Compression Index C_c	=	0.2166	25 - 50	0.000176
$C_c/(1+e_0)$	=	0.1261	50 - 100	0.000206
Pre-consolidation Pressure, p_c	=	208 kPa	100 - 200	0.000161
Swelling Index, C_s	=	0.0385	200 - 400	0.000125
Recompression Index, C_r	≈	0.0385	400 - 800	0.000074

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/38

e-logp curve

Bore hole No.: BH-4 Depth : 26.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7393		
Effective Overburden Pressure, p_0	=	214 kPa		
Compression Index C_c	=	0.2400	25 - 50	0.000196
$C_c/(1+e_0)$	=	0.1380	50 - 100	0.000191
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000178
Swelling Index, C_s	=	0.0650	200 - 400	0.000130
Recompression Index, C_r	≈	0.0650	400 - 800	0.000081

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/39

e-logp curve

Bore hole No.: BH-5 Depth : 1.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9439		
Effective Overburden Pressure, p_0	=	18 kPa		
Compression Index C_c	=	0.3167	25 - 50	0.000349
$C_c/(1+e_0)$	=	0.1629	50 - 100	0.000371
Pre-consolidation Pressure, p_c	=	123 kPa	100 - 200	0.000344
Swelling Index, C_s	=	0.0483	200 - 400	0.000219
Recompression Index, C_r	≈	0.0483	400 - 800	0.000112

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/40

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e-logp curve

Bore hole No.: BH-5 Depth : 4.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9128		
Effective Overburden Pressure, p_0	=	52 kPa		
Compression Index C_c	=	0.2816	25 - 50	0.000313
$C_c/(1+e_0)$	=	0.1472	50 - 100	0.000342
Pre-consolidation Pressure, p_c	=	132 kPa	100 - 200	0.000277
Swelling Index, C_s	=	0.0622	200 - 400	0.000188
Recompression Index, C_r	≈	0.0622	400 - 800	0.000098

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/41

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e-logp curve

Bore hole No.: BH-5 Depth : 5.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3503		
Effective Overburden Pressure, p_0	=	64 kPa		
Compression Index C_c	=	0.5069	25 - 50	0.000621
$C_c/(1+e_0)$	=	0.2157	50 - 100	0.000499
Pre-consolidation Pressure, p_c	=	141 kPa	100 - 200	0.000370
Swelling Index, C_s	=	0.0806	200 - 400	0.000234
Recompression Index, C_r	≈	0.0806	400 - 800	0.000145

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/42

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e-logp curve

Bore hole No.: BH-5 Depth : 7.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.6755		
Effective Overburden Pressure, p_0	=	93 kPa		
Compression Index C_c	=	0.7084	25 - 50	0.000837
$C_c/(1+e_0)$	=	0.2648	50 - 100	0.000621
Pre-consolidation Pressure, p_c	=	146 kPa	100 - 200	0.000433
Swelling Index, C_s	=	0.1132	200 - 400	0.000257
Recompression Index, C_r	≈	0.1132	400 - 800	0.000146

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/43

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e-logp curve

Bore hole No.: BH-5 Depth : 8.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1234		
Effective Overburden Pressure, p_0	=	82 kPa		
Compression Index C_c	=	0.4564	25 - 50	0.000605
$C_c/(1+e_0)$	=	0.2149	50 - 100	0.000468
Pre-consolidation Pressure, p_c	=	151 kPa	100 - 200	0.000354
Swelling Index, C_s	=	0.0844	200 - 400	0.000217
Recompression Index, C_r	≈	0.0844	400 - 800	0.000128

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/44

e-logp curve

Bore hole No.: BH-5 Depth : 10.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1493		
Effective Overburden Pressure, p_0	=	92 kPa		
Compression Index C_c	=	0.4896	25 - 50	0.000729
$C_c/(1+e_0)$	=	0.2278	50 - 100	0.000537
Pre-consolidation Pressure, p_c	=	153 kPa	100 - 200	0.000340
Swelling Index, C_s	=	0.0873	200 - 400	0.000212
Recompression Index, C_r	≈	0.0873	400 - 800	0.000122

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/45

e-logp curve

Bore hole No.: BH-5 Depth : 13.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.0518		
Effective Overburden Pressure, p_0	=	114 kPa		
Compression Index C_c	=	0.3945	25 - 50	0.000413
$C_c/(1+e_0)$	=	0.1923	50 - 100	0.000385
Pre-consolidation Pressure, p_c	=	174 kPa	100 - 200	0.000283
Swelling Index, C_s	=	0.0724	200 - 400	0.000206
Recompression Index, C_r	≈	0.0724	400 - 800	0.000122

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/46

e-logp curve

Bore hole No.: BH-5 Depth : 16.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7640		
Effective Overburden Pressure, p_0	=	138 kPa		
Compression Index C_c	=	0.2791	25 - 50	0.000247
$C_c/(1+e_0)$	=	0.1582	50 - 100	0.000267
Pre-consolidation Pressure, p_c	=	189 kPa	100 - 200	0.000216
Swelling Index, C_s	=	0.0701	200 - 400	0.000171
Recompression Index, C_r	≈	0.0701	400 - 800	0.000099

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/47

e-logp curve

Bore hole No.: BH-5 Depth : 29.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7338		
Effective Overburden Pressure, p_0	=	269 kPa		
Compression Index C_c	=	0.2634	25 - 50	0.000191
$C_c/(1+e_0)$	=	0.1519	50 - 100	0.000178
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000173
Swelling Index, C_s	=	0.0679	200 - 400	0.000145
Recompression Index, C_r	≈	0.0679	400 - 800	0.000090

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/48

e-logp curve

Bore hole No.: BH-5 Depth : 32.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6646		
Effective Overburden Pressure, p_0	=	299 kPa		
Compression Index C_c	=	0.2372	25 - 50	0.000188
$C_c/(1+e_0)$	=	0.1425	50 - 100	0.000185
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000172
Swelling Index, C_s	=	0.0561	200 - 400	0.000118
Recompression Index, C_r	≈	0.0561	400 - 800	0.000072

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/49

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e-logp curve

Bore hole No.: BH-6 Depth : 4.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.0163		
Effective Overburden Pressure, p_0	=	57 kPa		
Compression Index C_c	=	0.2968	25 - 50	0.000281
$C_c/(1+e_0)$	=	0.1472	50 - 100	0.000320
Pre-consolidation Pressure, p_c	=	135 kPa	100 - 200	0.000265
Swelling Index, C_s	=	0.0595	200 - 400	0.000170
Recompression Index, C_r	≈	0.0595	400 - 800	0.000102

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/50

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e-logp curve

Bore hole No.: BH-6 Depth : 6.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8653		
Effective Overburden Pressure, p_0	=	70 kPa		
Compression Index C_c	=	0.2850	25 - 50	0.000281
$C_c/(1+e_0)$	=	0.1528	50 - 100	0.000320
Pre-consolidation Pressure, p_c	=	143 kPa	100 - 200	0.000265
Swelling Index, C_s	=	0.0551	200 - 400	0.000170
Recompression Index, C_r	≈	0.0551	400 - 800	0.000100

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/51

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e-logp curve

Bore hole No.: BH-6 Depth : 7.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3115		
Effective Overburden Pressure, p_0	=	81 kPa		
Compression Index C_c	=	0.5503	25 - 50	0.000543
$C_c/(1+e_0)$	=	0.2381	50 - 100	0.000584
Pre-consolidation Pressure, p_c	=	150 kPa	100 - 200	0.000400
Swelling Index, C_s	=	0.0939	200 - 400	0.000243
Recompression Index, C_r	≈	0.0939	400 - 800	0.000140

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/52

e-logp curve

Bore hole No.: BH-6 Depth : 9.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3725		
Effective Overburden Pressure, p_0	=	90 kPa		
Compression Index C_c	=	0.4888	25 - 50	0.000646
$C_c/(1+e_0)$	=	0.2060	50 - 100	0.000470
Pre-consolidation Pressure, p_c	=	161 kPa	100 - 200	0.000320
Swelling Index, C_s	=	0.0877	200 - 400	0.000216
Recompression Index, C_r	≈	0.0877	400 - 800	0.000124

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/53

e-logp curve

Bore hole No.: BH-6 Depth : 10.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1252		
Effective Overburden Pressure, p_0	=	99 kPa		
Compression Index C_c	=	0.4297	25 - 50	0.000661
$C_c/(1+e_0)$	=	0.2022	50 - 100	0.000489
Pre-consolidation Pressure, p_c	=	168 kPa	100 - 200	0.000287
Swelling Index, C_s	=	0.0629	200 - 400	0.000181
Recompression Index, C_r	≈	0.0629	400 - 800	0.000099

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/54

e-logp curve

Bore hole No.: BH-6 Depth : 13.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	3.8976		
Effective Overburden Pressure, p_0	=	121 kPa		
Compression Index C_c	=	1.8146	25 - 50	0.000800
$C_c/(1+e_0)$	=	0.3705	50 - 100	0.000637
Pre-consolidation Pressure, p_c	=	177 kPa	100 - 200	0.000510
Swelling Index, C_s	=	0.3398	200 - 400	0.000387
Recompression Index, C_r	≈	0.3398	400 - 800	0.000226

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :**	**Fig. No.**
	CCPL/20101211	G/55

e-logp curve

Bore hole No.: BH-6 Depth : 16.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7655		
Effective Overburden Pressure, p_0	=	145 kPa		
Compression Index C_c	=	0.2929	25 - 50	0.000148
$C_c/(1+e_0)$	=	0.1659	50 - 100	0.000186
Pre-consolidation Pressure, p_c	=	198 kPa	100 - 200	0.000217
Swelling Index, C_s	=	0.0538	200 - 400	0.000180
Recompression Index, C_r	≈	0.0538	400 - 800	0.000109

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/56

e-logp curve

Bore hole No.: BH-6 Depth : 27.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7315		
Effective Overburden Pressure, p_0	=	239 kPa		
Compression Index C_c	=	0.2701	25 - 50	0.000191
$C_c/(1+e_0)$	=	0.1560	50 - 100	0.000181
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000178
Swelling Index, C_s	=	0.0597	200 - 400	0.000154
Recompression Index, C_r	≈	0.0597	400 - 800	0.000091

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/57

e-logp curve

Bore hole No.: BH-6 Depth : 30.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7137		
Effective Overburden Pressure, p_0	=	267 kPa		
Compression Index C_c	=	0.2322	25 - 50	0.000181
$C_c/(1+e_0)$	=	0.1355	50 - 100	0.000164
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000146
Swelling Index, C_s	=	0.0565	200 - 400	0.000109
Recompression Index, C_r	≈	0.0565	400 - 800	0.000070

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/58

e-logp curve

Bore hole No.: BH-7 Depth : 2.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1168		
Effective Overburden Pressure, p_0	=	41 kPa		
Compression Index C_c	=	0.4199	25 - 50	0.000415
$C_c/(1+e_0)$	=	0.1984	50 - 100	0.000473
Pre-consolidation Pressure, p_c	=	127 kPa	100 - 200	0.000364
Swelling Index, C_s	=	0.0600	200 - 400	0.000233
Recompression Index, C_r	≈	0.0600	400 - 800	0.000134

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/59

e-logp curve

Bore hole No.: BH-7 Depth : 4.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.0371		
Effective Overburden Pressure, p_0	=	52 kPa		
Compression Index C_c	=	0.4022	25 - 50	0.000325
$C_c/(1+e_0)$	=	0.1974	50 - 100	0.000412
Pre-consolidation Pressure, p_c	=	137 kPa	100 - 200	0.000363
Swelling Index, C_s	=	0.0606	200 - 400	0.000250
Recompression Index, C_r	≈	0.0606	400 - 800	0.000135

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/60

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e-logp curve

Bore hole No.: BH-7 Depth : 5.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	3.3963		
Effective Overburden Pressure, p_0	=	64 kPa		
Compression Index C_c	=	1.0763	25 - 50	0.000776
$C_c/(1+e_0)$	=	0.2448	50 - 100	0.000655
Pre-consolidation Pressure, p_c	=	144 kPa	100 - 200	0.000428
Swelling Index, C_s	=	0.1141	200 - 400	0.000267
Recompression Index, C_r	≈	0.1141	400 - 800	0.000143

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/61

e-logp curve

Bore hole No.: BH-7 Depth : 7.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.0898		
Effective Overburden Pressure, p_0	=	69 kPa		
Compression Index C_c	=	0.4450	25 - 50	0.000568
$C_c/(1+e_0)$	=	0.2129	50 - 100	0.000478
Pre-consolidation Pressure, p_c	=	156 kPa	100 - 200	0.000336
Swelling Index, C_s	=	0.0587	200 - 400	0.000208
Recompression Index, C_r	≈	0.0587	400 - 800	0.000127

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/62

e-logp curve

Bore hole No.: BH-7 Depth : 8.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2834		
Effective Overburden Pressure, p_0	=	80 kPa		
Compression Index C_c	=	0.4746	25 - 50	0.000508
$C_c/(1+e_0)$	=	0.2079	50 - 100	0.000411
Pre-consolidation Pressure, p_c	=	166 kPa	100 - 200	0.000282
Swelling Index, C_s	=	0.0511	200 - 400	0.000203
Recompression Index, C_r	≈	0.0511	400 - 800	0.000118

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/63

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e-logp curve

Bore hole No.: BH-7 Depth : 10.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4044		
Effective Overburden Pressure, p_0	=	89 kPa		
Compression Index C_c	=	0.5261	25 - 50	0.000541
$C_c/(1+e_0)$	=	0.2188	50 - 100	0.000400
Pre-consolidation Pressure, p_c	=	173 kPa	100 - 200	0.000312
Swelling Index, C_s	=	0.0670	200 - 400	0.000210
Recompression Index, C_r	≈	0.0670	400 - 800	0.000131

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/64

e-logp curve

Bore hole No.: BH-7 Depth : 13.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	3.4814		
Effective Overburden Pressure, p_0	=	108 kPa		
Compression Index C_c	=	1.6736	25 - 50	0.000749
$C_c/(1+e_0)$	=	0.3734	50 - 100	0.000777
Pre-consolidation Pressure, p_c	=	182 kPa	100 - 200	0.000502
Swelling Index, C_s	=	0.3624	200 - 400	0.000350
Recompression Index, C_r	≈	0.3624	400 - 800	0.000218

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/65

e-logp curve

Bore hole No.: BH-7 Depth : 16.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7482		
Effective Overburden Pressure, p_0	=	123 kPa		
Compression Index C_c	=	0.2769	25 - 50	0.000162
$C_c/(1+e_0)$	=	0.1584	50 - 100	0.000212
Pre-consolidation Pressure, p_c	=	197 kPa	100 - 200	0.000227
Swelling Index, C_s	=	0.0641	200 - 400	0.000167
Recompression Index, C_r	≈	0.0641	400 - 800	0.000103

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/66

e-logp curve

Bore hole No.: BH-7 Depth : 28.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7154		
Effective Overburden Pressure, p_0	=	248 kPa		
Compression Index C_c	=	0.2697	25 - 50	0.000210
$C_c/(1+e_0)$	=	0.1572	50 - 100	0.000199
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000190
Swelling Index, C_s	=	0.0667	200 - 400	0.000162
Recompression Index, C_r	≈	0.0667	400 - 800	0.000093

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/67

e-logp curve

Bore hole No.: BH-7 Depth : 31.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6992		
Effective Overburden Pressure, p_0	=	277 kPa		
Compression Index C_c	=	0.2570	25 - 50	0.000117
$C_c/(1+e_0)$	=	0.1513	50 - 100	0.000136
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000173
Swelling Index, C_s	=	0.0540	200 - 400	0.000147
Recompression Index, C_r	≈	0.0540	400 - 800	0.000091

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/68

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e-logp curve

Bore hole No.: BH-8 Depth : 1.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8377		
Effective Overburden Pressure, p_0	=	18 kPa		
Compression Index C_c	=	0.3326	25 - 50	0.000326
$C_c/(1+e_0)$	=	0.1810	50 - 100	0.000381
Pre-consolidation Pressure, p_c	=	128 kPa	100 - 200	0.000365
Swelling Index, C_s	=	0.0624	200 - 400	0.000248
Recompression Index, C_r	≈	0.0624	400 - 800	0.000127

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/69

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e-logp curve

Bore hole No.: BH-8 Depth : 4.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9795		
Effective Overburden Pressure, p_0	=	55 kPa		
Compression Index C_c	=	0.3209	25 - 50	0.000358
$C_c/(1+e_0)$	=	0.1621	50 - 100	0.000367
Pre-consolidation Pressure, p_c	=	137 kPa	100 - 200	0.000288
Swelling Index, C_s	=	0.0749	200 - 400	0.000202
Recompression Index, C_r	≈	0.0749	400 - 800	0.000114

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/70

e-logp curve

Bore hole No.: BH-8 Depth : 5.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2818		
Effective Overburden Pressure, p_0	=	67 kPa		
Compression Index C_c	=	0.5036	25 - 50	0.000524
$C_c/(1+e_0)$	=	0.2207	50 - 100	0.000535
Pre-consolidation Pressure, p_c	=	153 kPa	100 - 200	0.000350
Swelling Index, C_s	=	0.1113	200 - 400	0.000239
Recompression Index, C_r	≈	0.1113	400 - 800	0.000135

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :**	**Fig. No.**
	CCPL/20101211	G/71

e-logp curve

Bore hole No.: BH-8 Depth : 7.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4335		
Effective Overburden Pressure, p_0	=	77 kPa		
Compression Index C_c	=	0.6197	25 - 50	0.000705
$C_c/(1+e_0)$	=	0.2547	50 - 100	0.000594
Pre-consolidation Pressure, p_c	=	161 kPa	100 - 200	0.000390
Swelling Index, C_s	=	0.1108	200 - 400	0.000251
Recompression Index, C_r	≈	0.1108	400 - 800	0.000138

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/72

e-logp curve

Bore hole No.: BH-8 Depth : 8.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2375		
Effective Overburden Pressure, p_0	=	87 kPa		
Compression Index C_c	=	0.4158	25 - 50	0.000547
$C_c/(1+e_0)$	=	0.1859	50 - 100	0.000423
Pre-consolidation Pressure, p_c	=	172 kPa	100 - 200	0.000273
Swelling Index, C_s	=	0.0788	200 - 400	0.000174
Recompression Index, C_r	≈	0.0788	400 - 800	0.000106

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/73

e-logp curve

Bore hole No.: BH-8 Depth : 10.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.3376		
Effective Overburden Pressure, p_0	=	96 kPa		
Compression Index C_c	=	0.4617	25 - 50	0.000439
$C_c/(1+e_0)$	=	0.1975	50 - 100	0.000396
Pre-consolidation Pressure, p_c	=	180 kPa	100 - 200	0.000305
Swelling Index, C_s	=	0.0919	200 - 400	0.000198
Recompression Index, C_r	≈	0.0919	400 - 800	0.000118

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/74

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e-logp curve

Bore hole No.: BH-8 Depth : 13.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	3.1163		
Effective Overburden Pressure, p_0	=	113 kPa		
Compression Index C_c	=	1.6902	25 - 50	0.001073
$C_c/(1+e_0)$	=	0.4106	50 - 100	0.000719
Pre-consolidation Pressure, p_c	=	188 kPa	100 - 200	0.000569
Swelling Index, C_s	=	0.2513	200 - 400	0.000358
Recompression Index, C_r	≈	0.2513	400 - 800	0.000213

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :**	**Fig. No.**
	CCPL/20101211	G/75

e-logp curve

Bore hole No.: BH-8 Depth : 16.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7544		
Effective Overburden Pressure, p_0	=	130 kPa		
Compression Index C_c	=	0.2948	25 - 50	0.000202
$C_c/(1+e_0)$	=	0.1680	50 - 100	0.000226
Pre-consolidation Pressure, p_c	=	197 kPa	100 - 200	0.000221
Swelling Index, C_s	=	0.0745	200 - 400	0.000179
Recompression Index, C_r	≈	0.0745	400 - 800	0.000108

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/76

e-logp curve

Bore hole No.: BH-8 Depth : 28.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7269		
Effective Overburden Pressure, p_0	=	246 kPa		
Compression Index C_c	=	0.2797	25 - 50	0.000209
$C_c/(1+e_0)$	=	0.1619	50 - 100	0.000197
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000184
Swelling Index, C_s	=	0.0619	200 - 400	0.000161
Recompression Index, C_r	≈	0.0619	400 - 800	0.000097

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/77

e-logp curve

Bore hole No.: BH-8 Depth : 31.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7062		
Effective Overburden Pressure, p_0	=	275 kPa		
Compression Index C_c	=	0.2662	25 - 50	0.000184
$C_c/(1+e_0)$	=	0.1560	50 - 100	0.000172
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000158
Swelling Index, C_s	=	0.0508	200 - 400	0.000124
Recompression Index, C_r	≈	0.0508	400 - 800	0.000088

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/78

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e-logp curve

Bore hole No.: BH-10 Depth : 1.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9955		
Effective Overburden Pressure, p_0	=	27 kPa		
Compression Index C_c	=	0.3056	25 - 50	0.000341
$C_c/(1+e_0)$	=	0.1531	50 - 100	0.000356
Pre-consolidation Pressure, p_c	=	125 kPa	100 - 200	0.000312
Swelling Index, C_s	=	0.0723	200 - 400	0.000210
Recompression Index, C_r	≈	0.0723	400 - 800	0.000110

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/79

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e-logp curve

Bore hole No.: BH-10 Depth : 4.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8563		
Effective Overburden Pressure, p_0	=	57 kPa		
Compression Index C_c	=	0.3340	25 - 50	0.000375
$C_c/(1+e_0)$	=	0.1799	50 - 100	0.000416
Pre-consolidation Pressure, p_c	=	134 kPa	100 - 200	0.000325
Swelling Index, C_s	=	0.0748	200 - 400	0.000207
Recompression Index, C_r	≈	0.0748	400 - 800	0.000119

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/80

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e-logp curve

Bore hole No.: BH-10 Depth : 6.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9171		
Effective Overburden Pressure, p_0	=	67 kPa		
Compression Index C_c	=	0.3155	25 - 50	0.000319
$C_c/(1+e_0)$	=	0.1646	50 - 100	0.000347
Pre-consolidation Pressure, p_c	=	153 kPa	100 - 200	0.000263
Swelling Index, C_s	=	0.0402	200 - 400	0.000182
Recompression Index, C_r	≈	0.0402	400 - 800	0.000102

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/81

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e-logp curve

Bore hole No.: BH-10 Depth : 7.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.4912		
Effective Overburden Pressure, p_0	=	77 kPa		
Compression Index C_c	=	0.6614	25 - 50	0.000648
$C_c/(1+e_0)$	=	0.2655	50 - 100	0.000545
Pre-consolidation Pressure, p_c	=	159 kPa	100 - 200	0.000388
Swelling Index, C_s	=	0.1016	200 - 400	0.000259
Recompression Index, C_r	≈	0.1016	400 - 800	0.000150

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/82

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e-logp curve

Bore hole No.: BH-10 Depth : 9.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2093		
Effective Overburden Pressure, p_0	=	87 kPa		
Compression Index C_c	=	0.5506	25 - 50	0.000823
$C_c/(1+e_0)$	=	0.2492	50 - 100	0.000588
Pre-consolidation Pressure, p_c	=	166 kPa	100 - 200	0.000353
Swelling Index, C_s	=	0.0777	200 - 400	0.000213
Recompression Index, C_r	≈	0.0777	400 - 800	0.000126

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/83

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e-logp curve

Bore hole No.: BH-10 Depth : 10.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.7998		
Effective Overburden Pressure, p_0	=	97 kPa		
Compression Index C_c	=	0.6438	25 - 50	0.000546
$C_c/(1+e_0)$	=	0.2300	50 - 100	0.000439
Pre-consolidation Pressure, p_c	=	171 kPa	100 - 200	0.000320
Swelling Index, C_s	=	0.1088	200 - 400	0.000236
Recompression Index, C_r	≈	0.1088	400 - 800	0.000138

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/84

e-logp curve

Bore hole No.: BH-10 Depth : 12.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	2.3142		
Effective Overburden Pressure, p_0	=	106 kPa		
Compression Index C_c	=	0.8891	25 - 50	0.000882
$C_c/(1+e_0)$	=	0.2683	50 - 100	0.000567
Pre-consolidation Pressure, p_c	=	180 kPa	100 - 200	0.000365
Swelling Index, C_s	=	0.1269	200 - 400	0.000241
Recompression Index, C_r	≈	0.1269	400 - 800	0.000141

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/85

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e-logp curve

Bore hole No.: BH-10 Depth : 13.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	2.3272		
Effective Overburden Pressure, p_0	=	116 kPa		
Compression Index C_c	=	1.1612	25 - 50	0.000810
$C_c/(1+e_0)$	=	0.3490	50 - 100	0.000644
Pre-consolidation Pressure, p_c	=	188 kPa	100 - 200	0.000486
Swelling Index, C_s	=	0.2118	200 - 400	0.000325
Recompression Index, C_r	≈	0.2118	400 - 800	0.000201

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/86

e-logp curve

Bore hole No.: BH-10 Depth : 16.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7590		
Effective Overburden Pressure, p_0	=	142 kPa		
Compression Index C_c	=	0.3121	25 - 50	0.000295
$C_c/(1+e_0)$	=	0.1774	50 - 100	0.000296
Pre-consolidation Pressure, p_c	=	204 kPa	100 - 200	0.000222
Swelling Index, C_s	=	0.0603	200 - 400	0.000170
Recompression Index, C_r	≈	0.0603	400 - 800	0.000105

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/87

e-logp curve

Bore hole No.: BH-10 Depth : 19.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6075		
Effective Overburden Pressure, p_0	=	170 kPa		
Compression Index C_c	=	0.1949	25 - 50	0.000145
$C_c/(1+e_0)$	=	0.1212	50 - 100	0.000150
Pre-consolidation Pressure, p_c	=	233 kPa	100 - 200	0.000138
Swelling Index, C_s	=	0.0287	200 - 400	0.000115
Recompression Index, C_r	≈	0.0287	400 - 800	0.000070

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/88

e-logp curve

Bore hole No.: BH-10 Depth : 27.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7312		
Effective Overburden Pressure, p_0	=	245 kPa		
Compression Index C_c	=	0.2784	25 - 50	0.000211
$C_c/(1+e_0)$	=	0.1608	50 - 100	0.000194
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000185
Swelling Index, C_s	=	0.0623	200 - 400	0.000152
Recompression Index, C_r	≈	0.0623	400 - 800	0.000092

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/89

e-logp curve

Bore hole No.: BH-10 Depth : 30.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.6513		
Effective Overburden Pressure, p_0	=	275 kPa		
Compression Index C_c	=	0.2161	25 - 50	0.000162
$C_c/(1+e_0)$	=	0.1309	50 - 100	0.000150
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000136
Swelling Index, C_s	=	0.0295	200 - 400	0.000105
Recompression Index, C_r	≈	0.0295	400 - 800	0.000070

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/90

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e-logp curve

Bore hole No.: BH-11 Depth : 1.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8750		
Effective Overburden Pressure, p_0	=	18 kPa		
Compression Index C_c	=	0.2261	25 - 50	0.000281
$C_c/(1+e_0)$	=	0.1206	50 - 100	0.000309
Pre-consolidation Pressure, p_c	=	125 kPa	100 - 200	0.000235
Swelling Index, C_s	=	0.0269	200 - 400	0.000142
Recompression Index, C_r	≈	0.0269	400 - 800	0.000078

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/91

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e-logp curve

Bore hole No.: BH-11 Depth : 2.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9239		
Effective Overburden Pressure, p_0	=	41 kPa		
Compression Index C_c	=	0.2300	25 - 50	0.000279
$C_c/(1+e_0)$	=	0.1195	50 - 100	0.000285
Pre-consolidation Pressure, p_c	=	136 kPa	100 - 200	0.000199
Swelling Index, C_s	=	0.0315	200 - 400	0.000138
Recompression Index, C_r	≈	0.0315	400 - 800	0.000076

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :**	**Fig. No.**
	CCPL/20101211	G/92

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e-logp curve

Bore hole No.: BH-11 Depth : 4.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.9394		
Effective Overburden Pressure, p_0	=	53 kPa		
Compression Index C_c	=	0.2409	25 - 50	0.000246
$C_c/(1+e_0)$	=	0.1242	50 - 100	0.000252
Pre-consolidation Pressure, p_c	=	148 kPa	100 - 200	0.000206
Swelling Index, C_s	=	0.0311	200 - 400	0.000153
Recompression Index, C_r	≈	0.0311	400 - 800	0.000085

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/93

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e-logp curve

Bore hole No.: BH-11 Depth : 8.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.1822		
Effective Overburden Pressure, p_0	=	86 kPa		
Compression Index C_c	=	0.4129	25 - 50	0.000585
$C_c/(1+e_0)$	=	0.1892	50 - 100	0.000459
Pre-consolidation Pressure, p_c	=	158 kPa	100 - 200	0.000289
Swelling Index, C_s	=	0.0725	200 - 400	0.000179
Recompression Index, C_r	≈	0.0725	400 - 800	0.000103

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/94

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e-logp curve

Bore hole No.: BH-11 Depth : 10.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.7207		
Effective Overburden Pressure, p_0	=	98 kPa		
Compression Index C_c	=	0.6042	25 - 50	0.000611
$C_c/(1+e_0)$	=	0.2221	50 - 100	0.000521
Pre-consolidation Pressure, p_c	=	166 kPa	100 - 200	0.000350
Swelling Index, C_s	=	0.0988	200 - 400	0.000218
Recompression Index, C_r	≈	0.0988	400 - 800	0.000128

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/95

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e-logp curve

Bore hole No.: BH-11 Depth : 11.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	1.2110		
Effective Overburden Pressure, p_0	=	104 kPa		
Compression Index C_c	=	0.4498	25 - 50	0.000397
$C_c/(1+e_0)$	=	0.2034	50 - 100	0.000425
Pre-consolidation Pressure, p_c	=	172 kPa	100 - 200	0.000300
Swelling Index, C_s	=	0.0545	200 - 400	0.000205
Recompression Index, C_r	≈	0.0545	400 - 800	0.000112

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/96

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e-logp curve

Bore hole No.: BH-11 Depth : 14.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.8309		
Effective Overburden Pressure, p_0	=	122 kPa		
Compression Index C_c	=	0.3032	25 - 50	0.000280
$C_c/(1+e_0)$	=	0.1656	50 - 100	0.000289
Pre-consolidation Pressure, p_c	=	185 kPa	100 - 200	0.000215
Swelling Index, C_s	=	0.0689	200 - 400	0.000175
Recompression Index, C_r	≈	0.0689	400 - 800	0.000108

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/97

e-logp curve

Bore hole No.: BH-11 Depth : 17.50m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7732		
Effective Overburden Pressure, p_0	=	149 kPa		
Compression Index C_c	=	0.2872	25 - 50	0.000223
$C_c/(1+e_0)$	=	0.1620	50 - 100	0.000227
Pre-consolidation Pressure, p_c	=	195 kPa	100 - 200	0.000212
Swelling Index, C_s	=	0.0544	200 - 400	0.000175
Recompression Index, C_r	≈	0.0544	400 - 800	0.000102

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/98

e-logp curve

Bore hole No.: BH-11 Depth : 28.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7525		
Effective Overburden Pressure, p_0	=	253 kPa		
Compression Index C_c	=	0.2619	25 - 50	0.000316
$C_c/(1+e_0)$	=	0.1495	50 - 100	0.000274
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000209
Swelling Index, C_s	=	0.0604	200 - 400	0.000135
Recompression Index, C_r	≈	0.0604	400 - 800	0.000080

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/99

e-logp curve

Bore hole No.: BH-11 Depth : 31.00m

			Pressure Range (kPa)	Coefficient of Volume Compressibilty, m_v (Lab) (m^2/kN)
Initial Void Ratio, e_0	=	0.7054		
Effective Overburden Pressure, p_0	=	282 kPa		
Compression Index C_c	=	0.2508	25 - 50	0.000212
$C_c/(1+e_0)$	=	0.1471	50 - 100	0.000189
Pre-consolidation Pressure, p_c	=	--	100 - 200	0.000152
Swelling Index, C_s	=	0.0508	200 - 400	0.000115
Recompression Index, C_r	≈	0.0508	400 - 800	0.000077

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	**Job No. :** CCPL/20101211	**Fig. No.** G/100

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-5 Depth : 1.00m

Fig. H/1 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 19.5 % **Maximum Dry Density, γ_{dmax} : 1.664 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-5 Depth : 2.50m

Fig. H/2 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 15.5 % **Maximum Dry Density, γ_{dmax} : 1.690 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-6 Depth : 3.00m

Fig. H/3 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 16.0 % **Maximum Dry Density, γ_{dmax} : 1.751 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-7 Depth : 2.50m

Fig. H/4 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 20.0 % **Maximum Dry Density, γ_{dmax} : 1.650 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-8 Depth : 1.00m

Fig. H/5 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 18.4 % **Maximum Dry Density, γ_{dmax} : 1.700 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-8 Depth : 2.50m

Fig. H/6 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 15.7 % **Maximum Dry Density, γ_{dmax} : 1.736 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-10 Depth : 1.50m

Fig. H/7 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 19.0 % **Maximum Dry Density, γ_{dmax} : 1.680 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-10 Depth : 3.00m

Fig. H/8 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 14.6 % **Maximum Dry Density, γ_{dmax} : 1.740 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-11 Depth : 1.00m

Fig. H/9 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 17.7 % **Maximum Dry Density, γ_{dmax} : 1.726 gm/cm³**

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Water Content - Dry Density Relation using Light Compaction (Standard Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-11 Depth : 2.50m

Fig. H/10 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 18.1 % **Maximum Dry Density, γ_{dmax} : 1.720 gm/cm³**

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Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-5 Depth : 1.00m

Fig. H/11 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 14.0 % **Maximum Dry Density, γ_{dmax} : 1.850 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-5 Depth : 2.50m

Fig. H/12 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 12.0 % **Maximum Dry Density, γ_{dmax} : 1.810 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-6 Depth : 3.00m

Fig. H/13 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 12.4 % **Maximum Dry Density, γ_{dmax} : 1.872 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-7 Depth : 2.50m

Fig. H/14 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 14.4 % **Maximum Dry Density, γ_{dmax} : 1.838 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-8 Depth : 1.00m

Fig. H/15 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 13.4 % **Maximum Dry Density, γ_{dmax} : 1.870 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-8 Depth : 2.50m

Fig. H/16 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 12.2 % **Maximum Dry Density, γ_{dmax} : 1.845 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-10 Depth : 1.50m

Fig. H/17 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 13.6 % **Maximum Dry Density, γ_{dmax} : 1.860 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-10 Depth : 3.00m

Fig. H/18 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 11.0 % **Maximum Dry Density, γ_{dmax} : 1.858 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-11 Depth : 1.00m

Fig. H/19 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 12.4 % **Maximum Dry Density, γ_{dmax} : 1.907 gm/cm³**

Water Content - Dry Density Relation using Heavy Compaction (Modified Proctor Test)

Project :	Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock	Job No. :	CCPL/20101211

Details of Sample : Bore hole No. : BH-11 Depth : 2.50m

Fig. H/20 : Moisture Content vs. Dry Density Plot

Optimum Moisture Content : 13.0 % **Maximum Dry Density, γ_{dmax} : 1.900 gm/cm³**

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Job No. : CCPL/20101211 **Ref. Location: BH-3**

DESIGN DATA:

Pile diameter, D (m): 1.20
Pile cut-off level (m): (+)6.0
Pile founding level (m): (-)23.0
Pile type: Bored Cast-in-situ

Existing bed level (m): (+)4.3
Dredge level (m): (-)5.2
Ground water table: At G.L.
Factor of safety, FOS : 2.5

SOIL DATA FOR CAPACITY CALCULATIONS

Description of Layers					SPT value N	Bulk density γ (t/m^3)	Cohesion c (t/m^2)	Angle of internal friction prior to installation of pile ϕ (^{o})	#For design of bored pile
Sl. No.	Layer ID	Starting RL (m)	Ending RL (m)	Thickness (m)					
1	-	(+)6.0	(-)5.2	11.2	-	-	-	-	-
2	II	(-)5.2	(-)8.7	3.5	3	1.626	1.6	-	-
3	IIIA	(-)8.7	(-)13.7	5.0	12	1.923	6.1	-	-
4	IIIB	(-)13.7	(-)15.2	1.5	27	2.000	12.0	-	-
5	IIIB	(-)15.2	(-)18.2	3.0	43	2.070	19.0	-	-
6	IV	(-)18.2	(-)20.7	2.5	37	2.028	-	35.5	32.5
7	V	(-)20.7	(-)33.2	12.5	27	2.001	12.2	-	-
8	VI	(-)33.2	(-)36.2	3.0	40	2.058	-	37.0	34.0
9	VI	(-)36.2	(-)37.7	1.5	27	2.028	-	35.0	32.0
10	VI	(-)37.7	(-)45.7	8.0	40	2.056	-	37.0	34.0

Note: #As per Pile foundation and Analysis by H.G.Poulos and E.H.Davis [Page 27]

SAFE VERTICAL CAPACITY UNDER COMPRESSION
[Refer to IS: 2911(Part I/Sec 2)-2010]

Shaft Resistance

$Q_s = \Sigma(\alpha_i c_i + K_i P_{di} \tan\delta_i) A_{si}$ where, α_i: Adhesion factor; A_{si}: Area of shaft = $\pi D L_i$;
L_i: Length of pile in i^{th} layer; K_i: Earth pressure coefficient(varying between 1 to 1.5 for ϕ 30° to 40°);
P_{di}: Effective overburden pressure; δ_i: Angle of wall friction

Sl. No.	Layer ID	L_i (m)	R.L.* (m)	P_d^{*1} (t/m^2)	c (t/m^2)	α	ϕ (°)	δ (°)	K	Q_s (t)	ΣQ_s (t)
1	-	11.2	(+)0.4	0.0	-	-	-	-	-	-	
2	II	3.5	(-)7.0	1.1	1.6	1.000	-	-	-	-21.1	
3	IIIA	5.0	(-)11.2	4.5	6.1	0.730	-	-	-	83.9	
4	IIIB	1.5	(-)14.5	7.6	12.0	0.368	-	-	-	25.0	**271.5**
5	IIIB	3.0	(-)16.7	9.9	19.0	0.275	-	-	-	59.0	
6	IV	2.5	(-)19.5	12.8	-	-	32.5	32.5	1.13	86.5	
7	V	2.3	(-)21.9	15.2	12.2	0.361	-	-	-	38.2	

*: R.L./Depth where effective overburden pressure (P_d) is computed
*1: Effective overburden pressure restricted to a depth of 15D for $\phi \le 30°$ and increasing to 20D for $\phi \ge 40°$, when relevant depth exceeds such limit
Weighted average of ϕ = 0.0 Overburden pressure restriction = 15.00D

End Bearing Capacity

$Q_b = A_p(cN_c + 0.5\gamma' D N_\gamma + P_d N_q)$
where, α_i: Adhesion factor; γ': Effective unit weight of soil;
Ap: Cross-sectional area of pile toe = $\pi D^2/4$
N_c, N_q and N_γ: Bearing capacity factors

Founding level (m)	c (t/m^2)	ϕ (degree)	γ (t/m^3)	P_d (t/m^2)	N_c	N_q	N_γ	Q_b (t)
(-)23.0	12.2	-	2.001	16.4	9.0	-	-	**124.2**

Effective self weight of pile over existing soil surcharge

$$Q_{self} = \pi D^2/4 \times \Sigma[L_i \times (\gamma_c - \gamma_i)] = \mathbf{30.7\ t}$$

where, γ_c = unit weight of reinforced concrete = 2.5 t/m^3

Safe vertical pile capacity = $[\Sigma Q_s + Q_b]/FOS - Q_{self}$ = **127.6 t**

Suggested Vertical Capacity of Pile is 125t

UPLIFT CAPACITY

[Refer to IRC: 78: 2014]

Safe uplift capacity = $\frac{R_s x r_d}{F.S} + W$ = (271.5 x 0.7) / 2.5 + 30.7 = 106.7t

Where $R_s = \Sigma Q_s$ = Skin friction = 271.5t

r_d = Reduction factor = 0.7

F.S. = Factor of safety = 2.5

W = Effective Self Weight of pile = 30.7 t

Suggested Uplift Capacity of Pile is 100t

LATERAL LOAD CAPACITY

[Refer to IS: 2911(Part I/Sec 2)-2010]

Sl No.	Layer ID	R.L. (m)		Thick-ness (m)	η_h (t/m^3)	k_1 (t/m^3)	K (t/m^3)	Stiffness factor		Equivalent Stiffness factor
		From	To					T (m)	R (m)	T (m)
1	-	**(+)6.0	(-)5.2		-	-	-	-	-	5.1
2	II	(-)5.2	(-)8.7	3.5	20	-	-	6.6	-	
3	IIIA	(-)8.7	(-)13.7	5.0	169	-	-	4.3	-	
4	IIIB	(-)13.7	(-)15.0	1.3	385	-	-	3.7	-	
			Total =	9.8			-	-	-	

**Cut-off-level

Here, embedded length of pile L = [(-)5.2-(-)23.0] = 17.8m 4 x T

Therefore, pile is treated as intermediate pile

where $T = \sqrt[5]{\frac{EI}{\eta_h}}, R = \sqrt[4]{\frac{EI}{KB}}, I = \frac{\pi d^4}{64}, K = \frac{k_1}{1.5} \times \frac{0.3}{B}$

In which E = Young's modulus of pile material = 5000 x 25 $^{0.5}$ N/mm^2 = 2.50 x 10^6 t/m^2

assuming grade of concrete M25

Assuming fixed-head pile, equivalent length of pile

L_f = 1.93 x 5.1 = 9.8m (thickness of soil layer considered to assess T)

L_1= Cut-off level - Scour level = 11.2m

Where L_1 = Length of pile above Ground level / Scour level

Therefore, lateral load-carrying capacity of pile,Q = [12 x 2500000 x 0.1018 x 0.0267] / 9261 = 8.8t

where $Q = \frac{12\, xExIx\, \Delta}{(L_1 + L_f)^3}$ = for fixed head pile

Δ = maximum allowable lateral deflection at cut-off level of pile = 26.7mm
i.e 12mm at Scour Level (1% of pile dia.)

[As per Article 709.3.5 of IRC:78, 2014]

Suggested Lateral Capacity of Pile is 8.5t

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Job No. : CCPL/20101211 **Ref. Location: BH-7**

DESIGN DATA:

Pile diameter, D (m): 1.20
Pile cut-off level (m): (+)6.0
Pile founding level (m): (-)23.0
Pile type: Bored Cast-in-situ

Existing ground level (m): (+)7.3
Dredge level (m): -
Ground water table: At G.L.
Factor of safety, FOS : 2.5

SOIL DATA FOR CAPACITY CALCULATIONS

Description of Layers					SPT value N	Bulk density γ (t/m^3)	Cohesion c (t/m^2)	Angle of internal friction prior to installation of pile ϕ (^{o})	#For design of bored pile
Sl. No.	Layer ID	Starting RL (m)	Ending RL (m)	Thickness (m)					
1	—	(+)7.3	(+)5.8	1.5	-	1.855	-	-	-
2	I	(+)5.8	(+)1.8	4.0	3	1.764	1.7	-	-
3	II	(+)1.8	(-)7.7	9.5	4	1.670	2.1	-	-
4	IIIA	(-)7.7	(-)8.7	1.0	9	1.890	4.0	-	-
5	IIIA	(-)8.7	(-)13.7	5.0	15	1.948	7.2	-	-
6	IIIB	(-)13.7	(-)15.2	1.5	15	1.950	6.5	-	-
7	IIIB	(-)15.2	(-)18.2	3.0	28	2.010	12.5	-	-
8	IV	(-)18.2	(-)19.7	1.5	28	2.019	-	35.0	32.0
9	IV	(-)19.7	(-)20.7	1.0	40	2.070	-	37.0	34.0
10	V	(-)20.7	(-)27.2	6.5	21	1.964	9.0	-	-
11	V	(-)27.2	(-)31.7	4.5	39	2.050	17.0	-	-
12	V	(-)31.7	(-)33.2	1.5	24	1.980	11.0	-	-
13	VI	(-)33.2	(-)42.7	9.5	40	2.055	-	37.0	34.0

Note: #As per Pile foundation and Analysis by H.G.Poulos and E.H.Davis [Page 27]

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SAFE VERTICAL CAPACITY UNDER COMPRESSION
[Refer to IS: 2911(Part I/Sec 2)-2010]

Shaft Resistance

$Q_s = \Sigma(\alpha_i c_i + K_i P_{di} \tan\delta_i) A_{si}$ where, α_i: Adhesion factor; A_{si}: Area of shaft = $\pi D L_i$;
L_i: Length of pile in i^{th} layer; K_i: Earth pressure coefficient(varying between 1 to 1.5 for ϕ 30° to 40°);
P_{di}: Effective overburden pressure; δ_i: Angle of wall friction

Sl. No.	Layer ID	L_i (m)	R.L.* (m)	P_d *1 (t/m²)	c (t/m²)	α	ϕ (°)	δ (°)	K	Q_s (t)	ΣQ_s (t)
1	—	0.2	(+)5.9	1.2	-	-	-	-	-	-	**357.1**
2	I	4.0	(+)3.8	2.8	1.7	1.000	-	-	-	-25.6	
3	II	9.5	(-)3.0	7.5	2.1	1.000	-	-	-	75.2	
4	IIIA	1.0	(-)8.2	11.1	4.0	1.000	-	-	-	15.1	
5	IIIA	5.0	(-)10.7	13.5	7.2	0.624	-	-	-	84.7	
6	IIIB	1.5	(-)10.7	13.5	6.5	0.690	-	-	-	25.4	
7	IIIB	3.0	(-)10.7	13.5	12.5	0.353	-	-	-	49.9	
8	IV	1.5	(-)10.7	13.5	-	-	32.0	32.0	1.10	52.4	
9	IV	1.0	(-)10.7	13.5	-	-	34.0	34.0	1.20	41.2	
10	V	2.3	(-)10.7	13.5	9.0	0.497	-	-	-	38.8	

*: R.L./Depth where effective overburden pressure (P_d) is computed
*1: Effective overburden pressure restricted to a depth of 15D for $\phi \le 30°$ and increasing to 20D for $\phi \ge 40°$, when relevant depth exceeds such limit
Weighted average of ϕ = 0.0 Overburden pressure restriction = 15.00D

End Bearing Capacity

$Q_b = A_p(cN_c + 0.5\gamma' D N_\gamma + P_d N_q)$
where, α_i: Adhesion factor; γ': Effective unit weight of soil;
Ap: Cross-sectional area of pile toe = $\pi D^2/4$
N_c, N_q and N_γ: Bearing capacity factors

Founding level (m)	c (t/m²)	ϕ (degree)	γ (t/m³)	P_d (t/m²)	N_c	N_q	N_γ	Q_b (t)
(-)23.0	9.0	-	1.964	13.5	9.0	-	-	**91.6**

Effective self weight of pile over existing soil surcharge

$$Q_{self} = \pi D^2/4 \times \Sigma[L_i \times (\gamma_c - \gamma_i)] = \mathbf{21.5\ t}$$

where, γ_c = unit weight of reinforced concrete = 2.5 t/m³

Safe vertical pile capacity = $[\Sigma Q_s + Q_b]/FOS - Q_{self}$ = **158.0 t**

Suggested Vertical Capacity of Pile is 150t

UPLIFT CAPACITY

[Refer to IRC: 78: 2014]

Safe uplift capacity = $\frac{R_s x r_d}{F.S} + W$ = (357.1 x 0.7) / 2.5 + 21.5 = 121.5t

Where $R_s = \Sigma Q_s$ = Skin friction = 357.1t

r_d = Reduction factor = 0.7

F.S. = Factor of safety = 2.5

W = Effective Self Weight of pile = 21.5 t

Suggested Uplift Capacity of Pile is 120t

LATERAL LOAD CAPACITY

[Refer to IS: 2911(Part I/Sec 2)-2010]

Sl No.	Layer ID	R.L. (m)		Thick-ness (m)	η_h (t/m^3)	k_1 (t/m^3)	K (t/m^3)	Stiffness factor		Equivalent Stiffness factor
		From	To					T (m)	R (m)	T (m)
1	—	**(+)6.0	(+)5.8	0.2	20	-	-	6.6	-	6.6
2	I	(+)5.8	(+)1.8	4.0	20	-	-	6.6	-	
3	II	(+)1.8	(-)7.7	9.5	20	-	-	6.6	-	
4	IIIA	(-)7.7	(-)8.2	0.5	120	-	-	4.6	-	
			Total =	14.2			-	-	-	

**Cut-off-level

Here, embedded length of pile L = [(+)6.0-(-)23.0] = 29.0m>= 4 x T

Therefore, pile is treated as long pile

where $T = \sqrt[5]{\frac{EI}{\eta_h}}, R = \sqrt[4]{\frac{EI}{KB}}, I = \frac{\pi d^4}{64}, K = \frac{k_1}{1.5} \times \frac{0.3}{B}$

In which E = Young's modulus of pile material = 5000 x 25 $^{0.5}$ N/mm^2 = 2.50 x 10^6 t/m^2

assuming grade of concrete M25

Assuming fixed-head pile, equivalent length of pile

L_f = 2.18 x 6.6 = 14.4m (thickness of soil layer considered to assess T)

L_1= 0

Where L_1 = Length of pile above Ground level / Scour level

Therefore, lateral load-carrying capacity of pile,Q = [12 x 2500000 x 0.1018 x 0.012] / 2986 = 12.3t

where $Q = \frac{12\, xExIx\, \Delta}{(L_1 + L_f)^3}$ = for fixed head pile

Δ = maximum allowable lateral deflection at cut-off level of pile = 12.0mm (1% of pile dia.)

[As per Article 709.3.5 of IRC:78, 2014]

Suggested Lateral Capacity of Pile is 12t

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

BH-1

BH-2

BH-3

FIELD WORK IN PROGRESS

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

BH-4

BH-5

BH-6

FIELD WORK IN PROGRESS

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

BH-7

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FIELD WORK IN PROGRESS

Soil Investigation work for the upgradation of Berth No.7, NSD, N.S.Dock

BH-10

BH-11

FIELD WORK IN PROGRESS