

CONSTRUCTION OF SALES
BUILDING AND ALLIED
ELECTRICAL WORKS AT LANKA
IOC PLC "A" SITE PETROL SHED
M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Tender No:	LIOC/ ENG/ PT-03/2025-26
Due Date & Time :	21.10.2025 @ 14:00 Hrs

TECHNICAL BID

 Lanka IOC	TENDER NO: LIOC/ ENG/ PT-03/ 2025-26	Page 2 of 225
	TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.	

Tender No: LIOC/ ENG/ PT-02/2025-26

Dt: 30.09.2025

M/s.

.....

.....

Dear Sir,

**SUB: CONSTRUCTION OF SALES BUILDING AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A"
SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO**

- 1.0 Following documents forming a part of the mentioned tender are enclosed in single set for undertaking refurbishment works at the above petrol shed.

S/N	DESCRIPTION
	PART A: TECHNICAL/ COMMERCIAL BID
1	Introduction
2	Documents to be submitted by tenderers
3	Letter of undertaking to be furnished by tenderers (On letterhead of the firm)
4	Form of tender & Appendix
5	Important guidelines to tenderers
6	Abbreviations and notations
7	Particulars of Bid Bond and tender fee
8	Undertaking towards documents submission
9	Declaration to be signed and submitted with details
10	List Of Directors of LIOC
11	Scope of work & Special terms and conditions of contract
12	Terms and conditions - Safety
13	Safety Practices During Construction
14	Technical Specifications for Civil/ Mechanical/ Electrical and M & R works
15	List of Drawings
16	List of approved makes
17	Form of Agreement
18	Conditions of Contract Part I & Part II
19	Format for Bid Bond
20	Format for Performance Bond (Security) Bank Guarantee & Format of Warranty
	PART B: PRICE BID
1	Price bid

- 2.0 We request you to submit your lowest quotation for the work contained in the tender. Your offer complete in all respects must be submitted to reach this office of LIOC on or before **21.10.2025** at **14:00 hrs**. Offer may please be dropped in Engineering tender box kept in our office at address given below.

**LANKA LIOC PLC,
LEVEL 20, WEST TOWER, WORLD TRADE CENTRE,
ECHELON SQUARE, COLOMBO - 01, SRI LANKA**

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
3 of 225

- 3.0 **Bid Bond:** The bid bond for **LKR 321,000/-** in the form of demand draft (drawn in favor of Lanka IOC PLC payable at Colombo) must be submitted strictly in the Technical Bid cover.
- 4.0 **Tender Fee:** A tender fee of **LKR 5,000/-** (LKR Five Thousand only) drawn in favor of Lanka IOC PLC payable at Colombo should be submitted by a Crossed Demand Draft / Bankers Cheque should be submitted to LIOC. The tenders can also be downloaded from the web site of the firm (**www.lankaioec.com**) in which case the tender fee is not required to be submitted. Tenderers are advised that the tender is non-transferable. Submissions not accompanied by the prescribed tender fee or not downloaded from the official website are liable to be rejected.
- 5.0 Submission of Tender Documents:
- The tender envelope must be clearly superscribed with the tender number, due date and time of opening, name of the work tendered, and the name and address of the tenderer. The Technical Bid (to be labeled as COVER A) and the Price Bid (to be labeled as COVER B) shall each be placed in separate sealed envelopes. These two sealed envelopes (COVER A and COVER B) must then be enclosed in a third outer envelope, labeled as COVER C, which shall also be sealed.
- The outer envelope (COVER C) must be duly superscribed with the tender number, due date and time of opening, name of the work tendered, and the name and address of the tenderer. Failure to submit the tender documents in the prescribed manner will result in the offer being liable for rejection.
- 6.0 Tenderers are advised that LIOC shall not be held responsible for any postal delays in the dispatch or receipt of tender documents. Tenderers must also ensure that all pages of the tender documents, including any drawings issued, are duly signed, stamped, and submitted as part of the tender submission.

Thanking You,

Yours Faithfully,
For LANKA IOC PLC.,

VICE PRESIDENT (ENGG)

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
4 of 225

NOTICE INVITING TENDER



NOTICE INVITING TENDER

Tender no: LIOC/ ENG/ PT-03/ 2025-26

Lanka IOC PLC invites sealed tenders in prescribed tender form under two bid systems from Bonafide contractors as per following details

Name of the Work	SALE PERIOD (BOTH DAYS INCLUSIVE)	CONTACT PERSON
CONSTRUCTION OF SALES BUILDING AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO	30.09.2025 From 09:00 Hrs To 20.10.2025 upto 1700 Hrs	CONTACT PERSON: Assistant Manager (Engg) Tel : 011 2475719 Email: rasara@lankaio.com

Cost of tender: LKR 5,000/- (non-refundable)

In case the tender documents are downloaded from the official website, the cost of the tender shall not be applicable

Please visit our website www.lankaio.com for further details on these tenders.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

Page
5 of 225

NOTICE INVITING TENDER

1	TENDER NO.	LIOC/ ENG/ PT-03/ 2025-26
2	NAME OF WORK	CONSTRUCTION OF SALES BUILDING AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO
3	ESTIMATED COST	LKR 32.10 Mn The estimated cost is only directional, and the successful bidders cannot claim it as their right. The actual value of works can increase or decrease at the sole discretion of LIOC.
4	BID BOND	LKR 321,000/-
4A	MODE OF SUBMISSION OF BID BOND	By Demand draft in favour of Lanka IOC PLC payable at Colombo
5	SALES OF TENDERS (between 0900 Hrs to 1700 Hrs on working days)	
	a) STARTS ON	30.09.2025 at 09:00 Hrs
	b) CLOSES ON	20.10.2025 at 1700 HRS.
6	DUE DATE AND TIME :	
	a) SUBMISSION OF TENDERS	21.10.2025 @ 14:00 HRS
	b) OPENING OF TENDERS (Technical Bid Only)	21.10.2025 @ 14:30 HRS
7	PRE BID MEETING	10.10.2025 @ 11:00 HRS.
8	VERIFICATION OF ORIGINAL DOCUMENTS	22.10.2025, 23.10.2025, 24.10.2025 and 27.10.2025
9	TENDER FEE	LKR. 5,000/- (non-refundable / non transferable) drawn in favor of Lanka IOC PLC, payable at Colombo. In case the tender documents are downloaded from the official website, the cost of the tender shall not be applicable.
10	SECURITY DEPOSIT	Initial Security Deposit: 10% of the contract sum to be submitted within 10 days of Letter of Acceptance or alternatively, 25% of the total Initial Security deposit needs to be submitted before commencement of work and balance amount will be recovered at 10% of the certified Running Bill until the entire amount is recovered. No interest shall be payable on the Security Deposit / Initial Security Deposit/ Performance Guarantee This Security Deposit shall be submitted in the form of a Performance Bond (Security Deposit), as per the format provided in this tender. The BG shall be subsequently extended for a period to cover the date of completion of the work. This BG shall

SIGNATURE OF TENDERER
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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

Page
6 of 225

		be submitted directly by the bankers under their covering letter to the office of LIOC in a sealed cover.
11	COMPLETION PERIOD	16 (SIXTEEN) Weeks from the date of handing over
12	VALIDITY OF TENDER	04 (FOUR) Months from the date of tender opening
13	TENDER SUBMISSION	VICE PRESIDENT (ENGG), LANKA IOC PLC, LEVEL 20, WEST TOWER, WORLD TRADE CENTRE, ECHELON SQUARE, COLOMBO – 01, SRI LANKA
14	PAYMENT FOR EXTRA ITEMS	Payment for all the extra items if any shall be made as per LANKA IOC PLC- CAPEX BASE SOR Rates with applicable discount/surcharge quoted by the bidder in the Tender. In case of Non-SOR Items, Payment shall be made as per market rates/latest BSR Rates without discount/surcharge quoted by the bidder in the Tender. While executing any extra items, prior approval from Lanka IOC to be taken & all extra items will be paid with the final bill.

Sealed tenders in two bid systems (a) Technical bid with commercial terms and (b) Price Bid are invited from reputed, established and financially sound parties for **CONSTRUCTION OF SALES BUILDING AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO**. Parties meeting the following qualifying parameters as per details mentioned below, only need to apply:

QUALIFYING PARAMETERS:

Parties who satisfy the following qualification parameters as per the details given below only need apply.

SL	QUALIFYING PARAMETERS
1.	Value of Similar works completed in any of the last 3 years ending 31.08.2025 : - Three similar Completed works each of value not less than LKR 12.84 Mn or - Two similar Completed works of each value not less than LKR 16.05 Mn or - One similar Completed works of value not less than LKR 25.68 Mn
2.	Average Annual Financial turnover during last 3 financial years ending 31 st Mar' 2025 shall be at least LKR 9.63 Mn . Note: a. In absence of audited balance sheet for FY 2024-25, the bidder would be permitted to submit audited balance sheet for the 3 FY i.e. 2021-22, 2022-23 and 2023-24. b. In case the turnover for any of the above years is not furnished then, the turnover shall be taken as ZERO while computing average turnover.

Definition of Similar works: The party shall be a Civil/Mechanical contractor with proven experience in:

- Construction RCC structure/building, including excavation, foundation, piling, brick or RR masonry, Plastering, tiling, sanitary works, finishing works with allied electrical works;
- OR**
- Construction of Rigid or flexible pavements;

SIGNATURE OF TENDERER
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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
7 of 225

OR

- c. Combination of items (a) and (b).

Note:

- a. Proof of works completed as per qualifying parameters mentioned above shall be supported by **copies of work orders, final bill copies/ work completion certificates, payment details for completed work orders** etc indicating date of work order, date of completion of work and value of work completed etc.
- b. In case of works taken up prior to the qualifying period (3 years ending 31.08.2025) are completed during the qualifying period then, the cost of works completed in the qualifying period shall be reckoned for the purpose of qualification. Proof of turnover shall be supported by copies of audited Profit and Loss account statements & balance sheet indicating therein Professional receipts. In absence of audited balance sheet for FY 2024-25, the bidder would be permitted to submit audited balance sheet for the 3 FY i.e. 2021-22, 2022-23 and 2023-24. In case of non-submission of balance sheet for any relevant FY, the same shall be considered as ZERO for computation of avg. Turn Over.

TENDER FEE:

Tender documents (non-transferable) can be obtained from Engineering department, Lanka IOC PLC, 20th floor, West Tower, Echelon Square, Colombo, Sri Lanka by way of a request letter together with tender fee for **LKR 5,000/-** by way of Demand Draft drawn in favor of LANKA IOC PLC payable at Colombo. LIOC shall not dispatch tender documents by post or courier under any circumstances.

Tender documents can also be downloaded from our official website, www.lankaio.com, during the tender sale period. In such cases, tenderers must ensure that all documents are fully and correctly downloaded, as the responsibility for doing so rests solely with the individual tenderer.

Prior to downloading, tenderers are required to register on the website by providing accurate details, including the name of the firm, address, and other mandatory information. It is the tenderer's responsibility to complete the registration process well in advance and to download the documents before the closing date and time of sale.

Please note that if the name and address used for registration on the website do not exactly match the name and address mentioned in the tender submission, the tender shall be **summarily rejected**.

The tender documents downloaded are not transferable and can be used only by the registered tenderer who has downloaded the documents. Hence, any tender submitted by the tenderers who have neither bought the tender nor downloaded the same shall be rejected outright. **In case the tenders are downloaded, the tenderers are NOT required to submit the Tender Fee for LKR 5,000/- along with the Technical Bid documents.**

The Technical/Commercial Bid shall be opened on due date and time mentioned in the presence of Bidders at the above-mentioned address. Lanka IOC PLC reserves the right to accept / reject any or all tenders without assigning any reason whatsoever.

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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
8 of 225

Tenders received after the due date and time shall be rejected outright.

PERIOD OF CONTRACT (COMPLETION PERIOD):

16 WEEKS from the date of handing over the site which shall be taken as 10th day from the date of issue of Letter of Acceptance (LOA) or the actual date of handing over of the site whichever is earlier.

VALIDITY OF TENDER:

04 (FOUR) MONTHS from the date of opening of the tender.

PROCEDURE FOR SELECTION OF CONTRACTOR:

- A. **Submission of Documents towards qualifying parameters:** - Tenderer will be required to fill in and enclose documents in support of qualifying parameters together with relevant documents as given in the Statement of Credentials sheet attached. **OFFER OF THOSE TENDERERS NOT ENCLOSING ALL RELEVANT DOCUMENTS TOWARDS QUALIFYING PARAMETERS ARE LIABLE FOR REJECTION.**
- B. **Verification of Original Documents:** - Tenderers are required to report on the specified dates mentioned in the tender along with all original documents, copies of which have been submitted with the Technical Bid towards qualification. No separate communication will be issued to tenderers in this regard. **Tenderers who do not report for verification of original documents on date mentioned shall not be considered.**
- C. **Technical Qualification:** - Tenderer will be considered as technically qualified based on meeting the qualifying parameters and after verification of original documents towards the same as stipulated above. In the event the document submitted by the tenderer is found to be forged or incorrect, such tenderer shall **be rejected and bid bond submitted shall be forfeited immediately.** Such tender is also liable to be put on **Holiday List by LIOC.** Parties who have carried out the work on a subcontract basis shall not be eligible to participate in the tender.
- D. **Price Bid Opening & Finalization of parties:** Tenderers are required to quote fixed percentage above or below the rates given in the Price Schedule. Price Bid for technically qualified parties only shall be opened, after prior intimation to successful tenderers qualified in the Technical Bid. Status of tenderers shall be arrived at based on the price quoted by individual tenderers and arranged from lowest bidder to highest bidder. Only VAT is not considered for the evaluation of Price Bids. If VAT is Payable, VAT Shall be Paid Separately. In case of identical rates received, parties having higher annual average turnover in the last 3 financial years worked out to get precedence.

The works shall be awarded to the lowest tenderer with or without negotiation.

Canvassing information or submission of forged or false documents/information by any Tenderer shall make their offer invalid. In addition, action shall also be taken by Lanka IOC PLC for forfeiture of bid bond as well as putting the Tenderer on the Holiday list.

SIGNATURE OF TENDERER
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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
9 of 225**

Tenders should reach **VICE PRESIDENT (ENGG), LANKA IOC PLC, LEVEL 20, WEST TOWER, WORLD TRADE CENTRE, ECHELON SQUARE, COLOMBO – 01, SRI LANKA** before due date and time mentioned above

VICE PRESIDENT (ENGG)

INTRODUCTION

1	Name of Work	:	CONSTRUCTION OF SALES BUILDING WITH ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO
2	Place of Work	:	MALIGAWATTA, COLOMBO DISTRICT
3	Tender Ref	:	LIOC/ ENG/ PT-03/ 2025-26
4	Tender Due Date & Time	:	21.10.2025 @ 14:00 HRS
5	Tender Cost	:	LKR 5,000/- BY DEMAND DRAFT ONLY (If Downloaded Nil)
6	Bid Bond	:	LKR 321,000/- by DEMAND DRAFT ONLY
7	Contract Period	:	16 (Sixteen) Weeks from the date of handing over of the Site
8	Validity of Tender	:	04 (FOUR) Months from the date of tender opening (Technical Bid)
9	Pre-Bid Meeting	:	10.10.2025 @ 11:00 HRS
10	Verification of original documents	:	22.10.2025, 23.10.2025, 24.10.2025 & 27.10.2025
11	Tender Submission	:	VICE PRESIDENT (ENGG), LANKA IOC PLC, LEVEL 20, WEST TOWER, WORLD TRADE CENTRE, ECHELON SQUARE, COLOMBO – 01, SRI LANKA
12	Contact Person	:	MS. RASARA KODIKARA, ASSISTANT MANAGER (ENGG) TEL: +94 011 2475719 FAX: +94 011 2391490 OR 247578 EMAIL: rasara@lankaio.com

VICE PRESIDENT (ENGG)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
10 of 225

DOCUMENTS TO BE SUBMITTED BY THE TENDERERS

PUBLIC TENDER (TWO BID SYSTEM)

TECHNICAL BID/ COMMERCIAL BID ABSTRACT

(MUST BE FILLED BY THE TENDERER AND SUBMITTED ALONG WITH THE TECHNICAL BID)

SN	DETAILS	IOC's REQUIREMENT	DETAILS FURNISHED BY TENDERER
1	Bid Bond	LKR 321,000/-	
2	a. Mode of bid bond b. Details of bid bond(DD no date; date; Banker)	DD/ Pay Order/ Bankers' cheque	
3	Value of similar works as per Notice Inviting Tender (Copies of Work order, Work completion certificate, Final bills, Final Payment of work to be enclosed).	As per NIT	
4	Average Annual Turnover	As per NIT	
5	List of clients with WO copies,	To be enclosed	
6	Credentials	To be enclosed	
7	Validity of tender	04 (FOUR) months	
8	Contract period (Completion time)	04 (FOUR) months	
9	Bio data of important persons of the firm	To be enclosed	
10	Type of firm	To be furnished	
11	Tender documents have been signed on all pages with seal & submitted	To be confirmed	
12	Confirm that there are no deviations from tender conditions	To be furnished	
13	Confirm that bid bond instrument is enclosed in technical bid cover	To be confirmed	
14	Confirm that the Price bid does not contain any condition	To be confirmed.	

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
11 of 225**

SN	DETAILS	IOC's REQUIREMENT	DETAILS FURNISHED BY TENDERER
15	Confirm that the rates have been expressed in both figures and words	To be furnished	
16	Mobilization advance	Not applicable to this tender	
17	VAT Regn Number as applicable	To be Furnished	
18	Any other relevant information	To be furnished.	

SIGNATURE OF TENDERER:

SEAL & DATE

ADDRESS

VICE PRESIDENT (ENGG)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
12 of 225**

LETTER OF UNDERTAKING THE TENDERERS (ON LETTER HEAD OF THE FIRM)

**M/S. LANKA IOC PLC,
LEVEL 20, WEST TOWER, WORLD TRADE CENTRE,
ECHELON SQUARE, COLOMBO – 01**

Dear Sirs,

Sub: Tender LIOC/ ENG/ PT-03/ 2025-26

With reference to the above-mentioned tender, we wish to bring out the following:

1. We have gone through the technical bid documents comprising the Form of Tender, Instructions to tenderers, Special terms & conditions, Technical specifications, List of makes, Drawings and all other chapters forming part of the tender.
2. We hereby confirm that we shall sign the technical bid documents & drawings with a stamp and submit the same to your office in case we become successful in the tender. The documents shall be submitted prior to the placement of the purchase order by your firm.

Thanking You,

Yours Faithfully

(Signature of authorized person of tenderer)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
13 of 225

FORM OF TENDER

NOTE: The Appendix forms parts of Tender; Tenderers are required to fill up all the blank spaces in this Tender Form and Appendix.

To: **Lanka IOC PLC**
20, West Tower,
World Trade Centre,
Echelon Square,
Colombo 01.

1. I/We,..... Of
the undersigned, having examined the Form of Agreement, the Conditions of Contract, Form of Tender, Drawings, Specifications, Priced Bills of Quantities and the Schedule of Rates and Prices, do hereby offer and undertake to execute, complete and maintain the whole of the said works referred to in the schedule of the Form of Agreement in conformity with the said Drawings, Specifications and all other work in connection therewith and incidental falls pertinent thereto, to your entire satisfaction and strict accordance with the Conditions of Contract, at the rate and prices set forth in the said Priced Bill of Quantities and/or Schedule of Rate and Prices at the amount given at the end of the Priced Bills Of quantities or such other sums as may be ascertained in accordance with the Conditions of Contract.
2. And, I/We do hereby undertake to commence the works within **Ten (10) days** from the last date of Letter of Acceptance, or at the instance of the Engineer's order to commence, and to complete and deliver the whole of the works as aforesaid duration calculated from the last day of the aforesaid period in which works are to be commenced.
3. And further, I/We do hereby undertake to obtain the guarantee of a Bank with your approval, to be jointly and severally bound with us in a sum not exceeding ten percent (10%) of the aforementioned sum for the due performance of the contract under the terms of a Bond to be approved by you.
4. And I/We further agree, in the event of my/our failing to execute the said agreement or the said Bond, if required within **Seven (07) days** of my/our being called upon to do so, at the latest then any acceptance of this tender by you, may be revoked by you on behalf of the Employer and that I/We shall be held responsible for all and any damages suffered by the Employer in consequence of such delay or failure.
5. Unless and until the formal agreement is prepared and executed, I/We do hereby agree, that this tender together with your written acceptance thereof, shall constitute a binding contract between the two parties.
6. I/We understand that you are not bound to accept the lowest or any tender you may receive.
7. I/We further undertake to abide by this tender for a period of **Hundred and Twenty (120) days** from the last date fixed for "receiving of tenders" and that the same shall remain binding upon me/us and may be accepted at any time before the expiration of such period.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
14 of 225

In witness whereof, I/We do set my hand/our respective hands hereto at
on this Day of Two Thousand and Twenty Five.

Signature of Tenderer

in the capacity of and/or duly authorized to sign

this tender for and on behalf of

Signature

Seal & Address

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
15 of 225

APPENDIX TO FORM OF TENDER

	Clause	
Amount of Bid Bond	10	LKR 321,000/-
Period of Completion from Work order	41	16 Weeks
Amount of Liquidated damages	47 (1)	1% per week or part thereof
Limit of Liquidated damages	47 (1)	10% of the Work Order
Amount of bonus (if any)	47 (3)	None
Period of Maintenance	49	For LED canopy Lights 60 months and rest 1 year
The percentage of adjustment of		
Provisional sums	59 (4) (c)	Ten (10) percent
Mobilization Advance	60 (1)	Nil
Percentage of Retention/Performance Bond	60 (4) (a)	10% (TEN PERCENT)
Time within which payment to be made after certificate	60 (7)	14 days

In witness whereof, I/We do set my hand/our respective hands hereto at

on this Day of Two Thousand and Twenty-Five

Signature of Tenderer

in the capacity of and/or duly authorized to sign

this tender for and on behalf of

Signature

Seal & Address

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
16 of 225

IMPORTANT GUIDELINES TO TENDERERS

1.0 SUBMISSION OF TENDER:

1.1 Tender documents should be submitted only to the prescribed tender schedule form supplied by the LIOC. The tender should be submitted in cover/s (Sealed with wax) boldly super scribed on the outer cover, Tender Number, Closing date and time to reach the concerned authority as laid down in the Tender Form. The tender is to be dropped in the Tender Box kept at the concerned authority's office as specified in the tender document. The tender should reach the concerned authority as laid down in Tender Form, before the Closing date and time. Lanka IOC shall not be responsible for any postal delays; delays in transit etc. and request for extension of due date and time on such grounds shall not be entertained.

1.2 Tender documents are not transferable.

2.0 TENDER FEE

2.1 Tender fee of **LKR 5,000/-** (Rs. Five Thousand only) drawn in favor of Lanka IOC PLC payable at Colombo, should be submitted by crossed Demand Draft / Bankers Cheque to LIOC.

3.0 STUDY OF TENDER DOCUMENTS AND VISIT TO SITES

3.1 Tenderers should study the Tender Documents carefully before quoting. The tenderers should visit the site at their own cost and acquaint themselves with the site conditions. The tenderers are also expected to know about the availability of water, electricity, approach road-cum-construction materials, as per specifications, and any other ancillary facilities, since these are to be provided/arranged by the tenderers (Unless specified otherwise) at their cost to execute the works. All these factors must be considered while quoting.

4.0 FILLING OF TENDER DOCUMENTS

4.1 Tenderers must note that the rates in the price bid documents to be quoted must be in ink/type. In case of correction, the original figure must not be overwritten or obliterated by use of white ink. In case white fluid (ink) is used, the offers received from such tenderers shall be liable to be rejected, notwithstanding the status of the tenderers upon opening of price bids.

4.2 Every page of Tender Documents shall be signed by the Tenderer at the end of last entry there on. One complete set of drawings should be signed and returned by the Tenderers along with the Tender Documents.

4.3 All tenders and subsequent communication if any should be submitted in cover (Seal with tag) boldly superscribed on the outer cover, tender number, Closing date and time and sent by Registered post so as to reach the office of LIOC as laid out in the tender form before the closing date and time or dropped in the tender box kept in the concerned authority's office as laid out in the tender form before the closing date and time with the permission of the concerned authority.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
17 of 225

- 4.4 The rates Quoted should be inclusive of all materials, labor, equipment, lift, lead, taxes, duties etc. required in connection with completion of work to the entire satisfaction of LIOC. All the materials are to be supplied by the contractor, unless otherwise specified.

5.0 SUBMISSION OF PRICE BID:

- 5.1 The Price bid shall be submitted **only in LIOC's format**, enclosed as a percentage strictly in the manner prescribed therein. Rate in terms of a single Percentage shall be quoted only on the Grand Total indicated in the price schedule and not on individual items. **It may be carefully noted that, if the price bid is not enclosed in LIOC format and/or any counter condition(s) are incorporated/submitted with the Price bid, the tender shall be treated as invalid and shall result in rejection of the offer received, notwithstanding the financial position of the tenderer based on the rates quoted for the tender.**

- 5.2 Tenderer should clearly indicate their offer in the appropriate space given in the 'Percentage Offer' sheet and not at any other place.

- 5.3 Tenderers should quote their percentage both in figures and words in the appropriate spaces provided in the tender schedule. The total quoted amount towards the Tender shall be arrived at by applying the percentage quoted on the estimated total amount in the Price Schedule. **If the Tenderer does not quote the percentage both in figures and words at the right places, their tenders are liable to be rejected.**

- 5.4 Where there is a difference in the percentage quoted in figures and words, the percentage, which is quoted by the Tenderer in words, will be taken as correct.

- 6.0 Submission of the tender in a manner other than prescribed may lead to rejection of the offer. The date and time for receipt and opening of tenders, as determined by LIOC, shall be final, and no requests for extension or modification will be entertained. Please note that tenders will be opened on the due date in the presence of the intending tenderers or their authorized representatives only. Authorized representatives must carry a valid authorization letter, duly signed and attested by the Proprietor, Partner, or Director of the firm, as applicable.

- 7.0 In the event that identical rates are received from more than one tenderer, the tender shall be awarded to the tenderer whose average annual financial turnover for the preceding three financial years is higher. For this purpose, tenderers are required to submit copies of audited Profit & Loss statements for the financial years 2024-25, 2023-24, and 2022-23. Tenderers are further advised that if the turnover details for any particular financial year are not submitted, the turnover for that year shall be considered as ZERO while calculating the average annual turnover.

- 8.0 Power of attorney or Authorization of the person signing the tender documents should be attached, without fail, along with tender document.

- 9.0 **The tenders received without Bid Bond & Tender Fee (for Non-Downloaded Tenders) will be rejected.**

- 10.0 **Other Documents/Information Submission with the Tender**

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
18 of 225**

Copies of the following documents should also be attached with the Technical /Commercial Bid.

- i. Certificate of Incorporation in case of a Company
- ii. Power of Attorney in favor of the person signing the documents.
- iii. Registration Certificate in case of Public/ Private Limited Company OR Partnership Deed in case of Partnership Firms as applicable.
- iv. Copy of VAT Registration
- v. An affidavit that party is not black/holiday listed in enclosed Proforma.

11.0 ACCEPTANCE OF TENDER:

Incomplete Submission or Non submission of any required document may lead to rejection of the tender. Tenderers must ensure that all documents are duly filled, signed, and submitted in full. Incomplete tenders, conditional tenders, late submissions, or tenders not conforming to the prescribed terms and conditions including those not accompanied by the requisite Bid Bond and Tender Fee (for Non-Downloaded Tenders) will be rejected.

Requests for adjustment of pending bills or any other dues towards the Earnest Money Deposit (EMD) will not be entertained.

Lanka IOC is not bound to accept the lowest tender and reserves the right to reject any or all tenders without assigning any reason whatsoever. The Company also reserves the right to conduct negotiations with tenderers in a manner deemed appropriate by LIOC."

VICE PRESIDENT (ENGG)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
19 of 225

ABBREVIATIONS & NOTATIONS

UNLESS OTHERWISE SPECIFIED FOLLOWING NOTATIONS/ ABBREVIATIONS SHALL BE APPLICABLE
TO DOCUMENT

MM/mm	- MILLIMETER
SQMM/sqmm/mm ²	- SQUARE MILLIMETER
CM/cm	- CENTIMETER
SQCM/Sqcm	- SQUARE CENTIMETER
SFT/sft	- SQUARE FEET
M/m/rm/RM	- METRE / RUNNING METRE/ LINEAR METER
SQM/sqm/m ²	- SQUARE METRE
CUM/cum/m ³	- CUBIC METRE
KG/kg	- KILOGRAM
MT	- METRIC TONNE
MS	- MILD STEEL
DIA/dia/Φ	- DIAMETER
NO (S) / Nos. / nos.	- NUMBER(S)
RCC	- REINFORCED CEMENT CONCRETE
E-I-C	- ENGINEER - IN - CHARGE
IS/BIS	- INDIAN STANDARD
API	- AMERICAN PETROLEUM INSTITUTE
JOB	- JOB LUMPSUM
EMD	- EARNEST MONEY DEPOSIT
ISD	- INITIAL SECURITY DEPOSIT
BG	- BANK GUARANTEE

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
20 of 225

PARTICULARS OF TENDER FEE

DEMAND DRAFT NO:

DATED.....

ON BANK.....

FOR LKR.5,000/- (BY WAY OF DEMAND DRAFT PAYABLE AT COLOMBO).

PARTICULARS OF BID BOND

DEMAND DRAFT NO:

DATED.....

ON BANK.....

FOR LKR 397,000/- (BY WAY OF DEMAND DRAFT PAYABLE AT COLOMBO).

.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
21 of 225

STATEMENT OF CREDENTIALS

The party must meet the following Qualifying Criterion:

1. Party should have average annual financial Turn Over at least of LKR 9.63 Mn in last 3 financial years and One Similar work completed work order not less than LKR 25.68 Mn or Two Similar work completed work order not less than LKR 16.05 Mn or Three Similar work completed work order not less than LKR 12.84 Mn in the last 3 years ending 31.08.2025 as per Qualification Criteria mentioned in NIT
2. Bidders are advised to submit the following data with relevant certified supporting documents. Incomplete tenders may be rejected and Price Bid shall not be opened.

General Information

1	Name of the Company *	
2	Address	
3	Name of the Contact person	
4	Nature of Organization (i.e, proprietorship/ partnership/ Pvt Ltd/ etc) *	
5	Telephone / Fax/ Email	
6	Registration with Govt./ any organization *	
8	Any other details	

- Please attach relevant documents.

3. Interested Party should have an average annual Financial Turnover of LKR 9.63 Million or above in the last 3 financial years ending 31st March 2025.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
22 of 225

Financial Year	Turn Over (LKR)	Remarks
2024 – 2025/ 2021-2022		A photocopy of the audited balance sheet to be submitted. (Mandatory)
2023 - 2024		
2022 - 2023		

Note: Average Annual turnover of LKR 9.63 Mn in the last 3 financial years i.e. 2024-25, 2023-24 and 2022-23. In the absence of an audited balance sheet for FY 2024-25, the bidder would be permitted to submit an audited balance sheet for the financial year 2021-22.

4. Interested contractors should have successfully completed One Similar work completed work order of LKR 25.68 Mn or Two Similar work completed work order of LKR 16.05 Mn or Three similar work completed work order of LKR 12.84 Mn in the last 3 years ending 31.08.2025.

Name of the Client	Name of the Work	Work Order Details	Value of completed works	Date of completion	Remarks
					A photocopy of Purchase Order / Bill Copy and a Clear Certificate from the Client to be submitted. (Mandatory)

* Please attach separate sheets duly typed incorporating above information

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
23 of 225

UNDERTAKING TOWARDS DOCUMENTS SUBMISSION

We confirm that we have quoted the rates in this tender considering Inter-alia the:

1. Price Bid document
2. Special Terms and Conditions of Contract
3. Technical Specifications & Scope Of Services
4. Drawings
5. Terms & Conditions - Safety
6. Form Of Agreement
7. Conditions of contract (Part I & Part II)
8. All other documents forming part of the tender
9. Warranty Confirmation for LED Canopy Lights for 60 months by Supplier

We certify that, we have received the complete Tender Documents as mentioned and have studied the same thoroughly before submitting the Bid. We accept all the terms & conditions specified therein.

Signature of the Tenderer/ Authorized Representative

Name & Address: _____

Seal: _____

Telephone Nos.: _____

Date:

Place:

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
24 of 225

PROFORMA OF DECLARATIONS TO BE FURNISHED BY THE TENDERERS

DECLARATION - 'A'

We declare that we have complied with the Conditions of Contract (Part I & II)

Date :

Place :

**Tenderer's signature
Seal**

DECLARATION - 'B'

We declare that we do not have any employees who is related to any officer of LIOC PLC

OR

We have the following employees working with us who are near relatives of the Officer Director of LIOC

Name of the employee of the Tenderer	Name & designation of the Officer of LIOC

Date :

Place :

**Tenderer's Signature
Seal**

DECLARATION - 'C'

The Tenderer is required to state whether he is a relative of any Director of LIOC or the Tenderer is a firm in which any Director of LIOC or his relative is a partner or any other partners of such a firm or alternately the Tenderer is a private company in which Director of LIOC is a member or Director.

S/N	PARTICULARS	DETAILS
1	Name of the Tenderer and his relations with the Director in LIOC.	
2	Name of the Director of LIOC who is related to the Tenderer.	
3	Name of the Director of LIOC who is a member or a Director of the firm.	

Date :

Place :

**Tenderer's
Signature & Seal**

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
25 of 225**

DECLARATION – ‘D’

Tenderer is required to state whether they have employed any retired Director and above rank officer of LIOC in their firm. If so, details hereunder to be submitted.

S/N	PARTICULARS	DETAILS
1	Name of the person	
2	Post last held in LIOC	
3	Date of retirement	
4	Date of employment in the firm	

Date :

Place :

**Tenderer's
Signature & Seal**

N.B.

- A separate sheet may be attached, if the above is not sufficient.
- Strike out whichever is not applicable. If the tenderer employs any person subsequent to signing the above declaration and the employee/s so appointed happens to be the near relatives of the Officer/Director of LIOC, the tenderer should submit another declaration furnishing the name/s of such employee/s who is/are related to the officer/s of LIOC
- List of Directors of LIOC board is attached.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
26 of 225

LIST OF DIRECTORS OF LANKA IOC PLC

SN	NAME OF THE DIRECTORS & ADDRESSES
01	Mr. Anuj Jain , Chairman, Lanka IOC PLC 837, Asian Games Village ,Delhi (India) -110049
02	Mr. Sumitra Priya Srivastava , Director, Lanka IOC PLC B-1004,Aditya Celebrity Homes, Sector 76, Noida, Gowtham Budha Nagar,Uttar Pradesh (India) 201301
03	Mr. Rajesh Singh , Director, Lanka IOC PLC Flat No E401, Rohtas Presidential Vibhukti Khand, Gomti Nagar, Lucknow, Uttar Pradesh, (India) 226010
04	Mr. Dipak Das , Managing Director, LIOC, 20 th Floor, West Tower, World Trade centre, Colombo – 01, Sri Lanka.
05	Mr. Hector Manil Anthony Jayasinghe , Director, Lanka IOC PLC, No: 27, Elibank Road, Colombo 05, Sri Lanka
06	Mr. Sivakrishnarajah Renganathan , Director, Lanka IOC PLC, No: 27, Queens Road, Colombo 03, Sri Lanka

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
27 of 225

SPECIAL TERMS & CONDITIONS OF CONTRACT

1.0 COMPLETION OF CONTRACT:

- 1.1 Acceptance of a facility(s) by the LIOC does not constitute final completion of the contract. The contract shall be deemed to be executed in full and final measurement certified only when the contractor has fully discharged all obligations in terms of all contract documents.

2.0 SECURITY DEPOSIT/ PERFORMANCE BOND:

- 2.1 Forfeiture of Security Deposit: All sums of compensation or other sums of money payable by the Contractor may be deducted from SD. In the event of SD being reduced from the original quantum due to recoveries as aforesaid the contractor shall within 15 days of such recoveries make good deficiency in SD either by cash or by way of Demand Draft.

- 3.0 The tenderers must note that the rates and amount indicated in the schedule of works shall be applicable for all leads and lifts and reach involved. The LIOC also reserves the right to operate or not operate or partly operate any item mentioned in the schedule. The rates quoted for all items below the ground level shall be inclusive of adequate shoring, shuttering, bailing out sub-soil water (if found necessary) etc complete. The successful tenderer shall be responsible for implementation of all precautionary measures for ensuring safety for all materials and labor till such time the work is completed in all respects and handed over to the LIOC.

LIOC reserves the right to accept any tender in whole or in part and reject any or all tenders without assigning any reasons. The LIOC reserves the right to accept more tenders in part. The LIOC also reserves the right to accord purchase/ price preferences to the public enterprises and Joint ventures of the LIOC as per the prevailing policy. Decision of the LIOC in this regard will be final.

- 4.0 Any additional work that may become necessary during course of execution of works authorized by our site in charge shall be immediately approved prior to taking up the work duly forwarding the details, nature of works etc as per relevant clause of tender.

- 5.0 In case the contractor fails to adhere to the time limit specified above or if the rate of progress is considered not satisfactory, the LIOC will be at liberty to terminate the contract and get the same executed by any other agency entirely at the cost and risk of the original contractor and in line with provisions available under the tender.

- 6.0 Tenderers are advised to inspect the site and ascertain the site conditions, including leads/ lifts involved/ accessibility etc, prior to quoting the rates.

- 7.0 Location of site:

The Site is located at Maligawatta, Colombo

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
28 of 225

8.0 Water Supply:

The contractor shall arrange water required for the work at his own cost with all leads and lifts. LIOC shall not be responsible for supplying water and Contractor shall ensure timely and adequate supply of water to meet the schedule. Contractors should install approved metering device at their cost and prevailing rates shall apply for the quantity of water consumed.

9.0 Power Supply:

9.1 The contractor shall make his own arrangement for power required for the work at his cost. DG set of suitable capacity may be installed and operated by the contractor at his cost. LIOC shall not be responsible for power supply and contractor shall ensure proper supply of electricity to meet the schedule. Only flameproof cable and fittings of LIOC approved make shall be allowed for tapping the power. Contractors should install approved metering device at their cost and prevailing rates shall apply for the quantity of power consumed.

9.2 The electrical work shall be carried out through Licensed Electrical personnel only.

10.0 Contractor's Scope of Supply:

10.1 All materials including cement, sand, bricks, reinforcement, structural steel, consumables, testing appliances, tools and tackles necessary for completing the work, shall be procured & supplied by the Contractor at his own cost unless otherwise specified in the schedule. No claim/ delay on this account will be entertained by LIOC.

10.2 LIOC reserves the right in selection of best make of materials to be procured by the contractors & contractors shall procure the same only up on the approval by site in charge.

11.0 MATERIALS/EQUIPMENT:

11.1 All materials/equipment required for execution of work must be approved by our site representative before they are brought to the site and before being actually used. All facilities for prior inspection of materials/ equipment and subsequent inspection of work by our site engineer must be made available.

12.0 MATERIALS WITHOUT APPROVAL:

12.1 Any material brought without prior approval will be entirely at risk and cost of the contractor.

12.2 If the contractor brings defective/ substandard materials to site, it shall be the responsibility of the contractor for the removal and disposal of the same at his cost. The LIOC shall not entertain any claim from the contractor on this account in case the contractor fails to remove such materials within 15 days after issuing notice in writing to the contractor. LIOC reserves the right to dispose of such materials at the entire risk and cost of the contractor.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
29 of 225

13.0 Work order quantities are approximate, and payment shall be made as per actual measurements. The contractor is not entitled to any sort of compensation towards materials procured/ stored more than the measured quantity if any.

14.0 Excess quantities mentioned in the work order or extra items or deviation in work order should not be carried out by the contractor unless he has been asked to do so in writing and if carried out without such written approval, the same will be at risk and cost of the contractor

15.0 Detailed measurements of work carried out shall be jointly taken by the contractor and our site engineer at every stage of work before proceeding to the next stage

16.0 Excess quantities mentioned in the work order or extra items or deviation in work order should not be carried out by the contractor unless he has been asked to do so in writing and if carried out without such written approval, the same will be at risk and cost of the contractor

17.0 Entire work shall be carried out under the supervision of the authorized representative of the LIOC.

18.0 FIRM PRICE:

18.1 Once the offer is accepted and the agreement executed, the rates shall be valid till the completion of work in all respects, and no escalation whatsoever will be entertained on any grounds. Similarly, no variation or reimbursement shall be entertained due to revisions in statutory tax or levies imposed by the Government of Sri Lanka.

19.0 SAFETY AND SECURITY OF MATERIALS:

19.1 The responsibility for the materials and equipment brought or installed by the contractors (till they are handed over to LIOC) will remain with the contractor and any claim of whatsoever nature due to any loss or otherwise will not be entertained. The contractor will have to hand over the completed job in its entirety as per the work order.

20.0 LIOC SUPPLIED MATERIALS:

20.1 The tanks, equipment, and any other materials to be supplied by the LIOC will be supplied anywhere within the premises. The transporting and handling of the same to actual location of installation will be the contractor's responsibility for which no extra payment will be made. Any damage caused to our equipment/ property while handling and installing the will have to be repaired by the contractor at his risk and cost.

21.0 SAFETY OF LIOC SUPPLIED MATERIALS:

21.1 Once the Dus and other LIOC supplied items are handed over to the contractor, the safety of the same shall be the contractor's responsibility.

22.0 SECURITY OF CONTRACTOR'S MATERIALS:

22.1 LIOC shall not be responsible for security of contractor's materials/ equipment.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
30 of 225

23.0 STORAGE SPACE:

23.1 No covered space shall be released for storage/ stacking of contractor's materials. The contractor shall make his own arrangement for the same.

28.0 MEASUREMENTS FOR WORKS/RECORD MEASUREMENTS/ BILLS:

28.1 All the payment for quantities certified in the running account/ final bill shall be as per the details recorded in the standard measurement book of the LIOC and jointly signed by the Contractor/ site engineer of IOC or authorised representative or Agency appointed by LIOC.

28.2 Method of measurement shall be strictly in accordance with the technical specification for this work.

28.3 The payment shall be as per the details entered in the standard Measurement Certificate bills of the LIOC.

29.0 PAYMENT TERMS:

29.1 **Mobilization advance:** Not applicable for this Tender.

29.2 **Running Bills:**

In case successful tenderer submitted the full amount of Initial Security deposit (10% of the total work order) 100% of the item rate on progressive completion of works with respect to Running invoices payment will made.

In case successful Tenderer Submitted 25% of Initial Security deposit only then 10% of the running bills will be deducted up to recovery of Balance amount of Initial Security deposit

VAT actual can be claimed on Running Bills

30.0 ON ACCOUNT PAYMENTS:

30.1 Payments will be made through e banking mode only.

31.0 SPECIAL CLAUSE:

31.1 The contractor is required to take necessary care to protect the existing nearby structure while carrying out his scope of work. Any damage caused to other property shall be rectified at its own cost.

32.0 WORKS BY OTHER CONTRACTORS:

32.1 Along with works covered under this tender, tank fabrication/ erection works, civil works etc may be carried out simultaneously by other contractors. The successful tenderer should extend full co-operation to the contractors, and the work should be carried out in such a way

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
31 of 225

as not to affect the progress of works. Any damage caused should be rectified by the representative contractor at his own risk and cost.

33.0 WARRANTY:

33.1 All equipment, including components and sub-contracted items, should be guaranteed by the Vendor within the defect liability period mentioned in the tender. In the event of any defect in the equipment or workmanship manifesting itself, the tenderer will replace/ repair the equipment/ materials at the Vendor's cost and risk on due notice, failing which the rejected equipment will be sent to the Vendor on Freight To Pay basis for free replacement.

- **LED Canopy Lights:** LED Canopy Lights shall carry out 5 years of warranty, inclusive of reduction in Lux levels (One to one replacement).
- **Civil Works/Mechanical Equipment such DAG, Nitrogen Inflator etc:** 1 year warranty

34.0 TESTING OF MATERIALS/ WORKS:

34.1 The Contractor shall carry out the various tests as enumerated in the technical specifications of this tender document and the technical documents that will be furnished to him during the performance of the work, and no separate payment shall be made unless otherwise specified in the schedule of rates.

34.2 All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.

34.3 The work is always subject to inspection by the Site Engineer/ Engineer-in-Charge/ representatives nominated by LIOC. The Contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical documents and the relevant codes of practice furnished to him during the performance of the work.

34.4 Any work not conforming to the execution drawings, specifications or codes shall be rejected forthwith and the contractor shall carry out the rectifications at his own cost.

34.5 All results of inspection & tests will be recorded in the inspection reports, proforma, which will be approved by the Site Engineer/ Engineer-in-Charge. These reports shall form part of the completion documents.

34.6 Inspection & acceptance of works shall not absolve the Contractor from any of his responsibilities under this Contract.

35.1 BILL OF QUANTITIES:

35.1 Bill of quantities are approximate, and payment shall be made as per actual certified measurements. Excess quantities in the Schedule rates or extra item will be paid with Final Bill. The contractor is not entitled to any sort of compensation for excess materials procured/stored.

35.2 After the placement of the order, the successful tenderer shall not be allowed to sublet or assign any part of the work order without LIOC's prior written consent

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
32 of 225**

36.0 PROJECT MANAGEMENT TEAM:

36.1 The successful tenderer, within 10 days of receipt of acceptance of tender, name the project management team with the Project Engineer responsible for the job at site on behalf of the contractor. Bidder should give in writing to the LIOC, the name of his authorized and qualified engineer who will supervise the work and remain full time at the site during execution of the job.

36.2 The assigned Project Management Team having following qualifications

Sr No	Manpower	Numbers	Experience	Deduction per Month if not deployed full time
1	Project Engineer	1	BSc (Hon's) in Civil Engineering from State Universities of Sri Lanka (SLQF Level 6) with experience of 4 years OR BSc/BE/ BTech in Civil Engineering (SLQF Level 5) with experience of 5 years OR Diploma Holders (HND/NDT/NDES) in Civil Engineering (SLQF Level 4) with Experience of 8 Years	LKR 45,000
2	Site QS	1	NCT (QS) in Civil Engineering with 5 years' experience.	LKR 25,000

37.0 ACCEPTANCE OF TENDER BY LIOC:

37.1 Incomplete tenders, conditional offer, tenders received late (i.e. after due date and time for opening) and tenders not conforming to the terms and conditions prescribed in the tender documents or not accompanied by the requisite Bid Bond will be rejected. Requests for adjustment of pending bills or any other amount towards Bid Bond will not be accepted. LIOC is not bound to accept the lowest tender and reserves the right to reject any or all tenders without assigning any reason whatsoever and or to carry out negotiations with the tenderers in the manner considered suitable to the Company.

37.2 The tenderers may have to attend to the office of LIOC for negotiations/ clarifications required by them in respect of their quotations without any commitment to the part of the Company.

37.3 In case of negotiation, the tenderer should send confirmation of such negotiation to reach the office of the LIOC within 2 days from the date of negotiations failing which the LIOC reserves the right to ignore the quotation.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
33 of 225

38.0 ACCEPTANCE OF WORK ORDER BY TENDERER:

- 38.1 After communication of the LIOC's acceptance of the contractor's tender, if the contractor fails to return the duplicate copy of the work order and agreement duly signed as token of their acceptance within 10 days, the Bid bond may be forfeited by the LIOC, without any further reference to the contractor.

39.0 EXECUTION OF AGREEMENT:

- 39.1 On acceptance of the quotation, the successful contractor will have to execute an agreement with the LIOC covering all aspects of the contract in standard specimen form attached, immediately before commencement of the works. The intending tenderers should acquaint themselves with the provisions of standard agreement prior to quoting.

40.0 POWER OF ATTORNEY:

- 40.1 When the party signing the agreement is not the sole proprietor, the necessary power of attorney authorizing the person who is acting on behalf of the firm should be produced before execution of the agreement.

41.0 EXECUTION OF WORK:

- 41.1 The contractor shall submit on receipt of the work order and before starting the work, shall submit a detailed construction program chart (Gantt Chart) in the form of (PERT/ MS PROJECT/Primavera or at least in Excel) adhering to the completion time quoted in the work order. The program thus submitted shall form a part of the contract and shall be binding on the contractor. However, LIOC reserves the right to alter the program if necessary. No claim whatsoever of the contractor on this account will be entertained.

42.0 NATURE AND SCOPE OF WORK:

CONTRACTOR'S SCOPE OF WORK:

The contractor's scope of work includes, but is not limited to, the following

42.1 GENERAL

- a. Prior to commencement of the work contractor must take Insurance for Contractor all Risks covering injuries/fatal damages or accidents for people in the working environment, damages to third-party properties or vehicles etc. No additional payment will be made in this regard
- b. While Demolition of existing infrastructure (except MSP Foundation/MSP and Boundary wall inclusive of foundations) and execution of works in the entire contract period, Contractor shall take care of MSP, MSP Foundation and Boundary wall, if any damages occurred, Contractor shall be responsible for repairing the damages at Contractor's own cost (While demolition work and all phase construction of Works contractor take care of MSP with MSP foundation and Boundary wall)

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
34 of 225**

- c. All work must be carried out in the retail outlet which reason all required safety precautions are to be taken as per Lanka IOC PLC norms and as directed at site. If any petroleum product is present at RO, obtaining a work permit is mandatory for executing any kind of work. Due to Operational and safety reasons, work may have to be carried out in restricted timing & in day & night as per site requirements. Tenderers, while quoting rates may consider all the above factors and quote accordingly.
- d. Supply of all material, equipment, labor, tools & tackles, consumables etc. to complete the work as per provision of tender document and specification.
- e. Making as-built details/drawings and one set of construction drawings and return to owner with the final Invoice.
- f. The scope of work comprises the construction of a new Sales Building and as per items contained in the price schedule. Tenderers are advised to inspect the site and ascertain the site conditions including leads/lifts involved/ approach to vehicles/Dewatering/Shoring etc prior to quoting the amount.

42.2 The broad scope of execution of work is indicated below for site:

- 1. Construction of buildings, including RCC framed structure, plastering, flooring, painting, aluminum doors/ windows/ ventilators/ glazing and allied electrical works. All sanitary & plumbing works include pipelines for water supply, septic tank & soak pit, water storage tank & allied connections and sanitary fittings.
- 2. Supply and installation of Electrical Panel & Electrification work of RO & etc.
- 3. However, above list is indicative and work may be required to be carried out as per the requirements of site and as per BOQ.
- 4. Test Reports mentioned in the technical specifications need to be submitted with the final Bill

42.3 Scope of supply includes all the required materials unless/otherwise specifically mentioned in either price bid or special terms and conditions. It will be the responsibility of the Contractor to provide at their cost all required workers/labor, equipment, machinery and all materials to complete as per drawing and specification.

42.4 The work descriptions and specifications are as per the enclosed documents.

43.0 METHOD OF WORK:

43.1 The contractor shall carry out works as per directions in the work order. The contractor shall not undertake on his own any change in the specifications mentioned in the tender documents and work order. In case of doubt, the contractor will refer to the matter in writing and the contractor shall carry out the item of work as per the clarifications given. In case of delay in getting such clarifications, the contractor will not be entitled to any claim on any account of idling their laborers, machinery etc. In case the contractor carries out the work as per his own specifications not acceptable to the LIOC in such cases, the same will be required

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
35 of 225**

to be redone as per the specifications given by the LIOC at the contractor's risk and cost. In case of failure to re-do the work by the contractor, the LIOC reserves the right to get it done through any other agency entirely at the risk and cost of the contractor.

44.0 LIOC'S RIGHT:

44.1 LIOC reserves the right to increase/ decrease the tendered quantity of any or every item and delete any item at any stage of work at the accepted rates. The contractor's claim for compensation or damages on account of these shall not be entertained.

44.2 The scope of works of Lanka IOC shall be limited to the following:

- Offer of clear and unobstructed work front at Site
- Space required for provision of meter/ inverter etc.
- Un-obstructed access to the facilities related to Solarization for the purpose of routine break down maintenance or inspection.
- Lanka IOC also provide copies of CEB bills indicating the power generated and which shall be used for releasing the payment for AMC as described elsewhere in the tender document.

45.0 REVISIONS:

45.1 LIOC reserves the right to revise the specifications, drawings and designs at any stage of work. Such deviations shall be adjusted at the rates already contained in the work order or at the prevailing market rates, if the rates are not available in the work order.

46.0 MEASUREMENTS:

46.1 All works shall be measured as per the procedure laid down in relevant standards and final payment shall be as per the measured quantities and not as per work order quantities.

47.0 PROGRESS REPORT OF WORK:

47.1 Contractor shall report and submit progress report of the work fortnightly to the concerned office which has awarded the contract with photographs on daily basis,

48.0 MAINTENANCE OF INSTRUCTION BOOK:

48.1 The contractor at site will maintain an instruction book serially numbered having one original and two copies of each page so that our visiting officers/ site engineers can issue instructions regarding progress and quality of work to the contractor. The contractor or the contractor's representative will sign in the instruction book in token of receipt of and understanding of such instruction. The original copy of the instruction page shall be sent to the concerned Engineer, and second copy will be retained by the issuing person and the third copy shall be retained by the contractor.

49.0 CANCELLATION OF ORDER:

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
36 of 225**

49.1 If the performance of the successful contractor is found to be not satisfactory, the LIOC reserves the right to cancel in part or whole of the contract and get the work executed through alternate agencies entirely at risk and cost of original contractor on whom the order was first placed. In such cases, the contractor should make good all losses that the LIOC may suffer on account of such cancellation of work orders.

50.0 ABANDONMENT OF WORK:

50.1 In case the contractor abandons the work, the LIOC shall issue the final notice to the contractor to be present at site for taking final measurements and in case the contractor does not report at site on due date and time as per the LIOC's notice, the LIOC's representative will take unilateral measurements of abandoned work which will be final & binding on the contractor. Balance works will be carried out by alternate agency to be appointed by LIOC entirely at risk and cost of the contractor.

51.0 STATUTORY RULES AND REGULATIONS:

51.1 The contractor will abide by the rules, regulations, bye laws and statutes etc. imposed by the government/ semi-government and other local authorities for execution of job.

52.0 OMISSIONS/ DELETIONS:

52.1 Any omission/ deletion noticed in the terms without the prior approval of the LIOC, shall result in rejection of the contractor's claim for payment of these items.

53.0 SITE CLEANING:

53.1 The Contractor shall promptly dispose of all demolition debris outside the RO premises. It is the Contractor's responsibility to arrange a suitable location for the disposal of such debris. The Contractor shall take due care while disposing of waste materials throughout the project and ensure that any rules/ regulations laid down by Municipal Council or any other statutory body are not violated.

53.2 The Contractor shall be responsible and answerable to any complaint arising out of improper disposal of waste material. Quoted rate shall involve the cost of same and no extra payment shall be made towards this account.

53.3 Working site should be always kept cleared up to the entire satisfaction of the Engineer-in-Charge. Before handing over any work to owner the contractor in addition to other formalities to be observed as detailed in the document, - shall clear the site to the entire satisfaction of Engineer-in-Charge.

53.4 The Contractor shall clear the site of works as per the instructions of the Site Engineer. The site of works shall be cleaned of all men, site equipment, materials, etc and shall be delivered back to the Lanka IOC PLC in a clean and neat condition as required by the Site Engineer within a period of one week after the job is completed after ensuring that all surfaces spoiled during the works such as floors, walls, glass panels, etc are spotless clean.

53.5 In case of failure to do so by the Contractor, the Corporation shall have the right to get the

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
37 of 225

site cleared at the risk and cost of the Contractor.

54.0 MISCELLANEOUS REQUIREMENTS:

- 54.1 It shall be contractor's responsibility to obtain approval for any revision and/or modifications decided by the contractor from the Owner/Engineer-in-Charge before implementation. Also, such revisions and/or modification if accepted / approved by the Owner/Engineer-in-Charge shall be carried out at no extra cost to the owner.
- 54.2 Any changes required during and/or after approval for detailed construction drawings due to functional requirements or for efficient running of system keeping the basic parameters unchanged and which have not been indicated by the Contractor in the data / drawings furnished along with the offer will be carried out by the contractor at no extra cost to the owner.
- 54.3 All expenses towards mobilization & demobilization including bringing in equipment, clearing the site etc. shall be deemed to be included in the prices quoted and no separate payments on account of such expenses shall be entertained.
- 54.4 It shall be entirely Contractor's responsibility to provide, operate & maintain necessary construction equipments, scaffoldings and safety gadgets, cranes and other lifting tackles, tools and appliances to perform the work in a workman like an efficient manner & complete all jobs as per time schedules.
- 54.5 Preparing approaches and working areas for movement and operation of the cranes, levelling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, existing facilities, local labor etc. to provide suitable allowances in his quotation. The Contractor, at his own cost, may have to build temporary access roads to aid his own work which shall also be taken care while quoting for the work
- 54.6 Preparing approaches and working areas for movement and operation of the cranes, levelling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, existing facilities, local labor etc. to provide suitable allowances in his quotation. The Contractor, at his own cost, may have to build temporary access roads to aid his own work which shall also be taken care while quoting for the work
- 54.7 Preparing approaches and working areas for movement and operation of the cranes, levelling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, existing facilities, local labor etc. to provide suitable allowances in his quotation. The Contractor, at his own cost, may have to build temporary access roads to aid his own work which shall also be taken care while quoting for the work
- 54.8 The procurement and supply in sequence and at the appropriate time of all materials & consumables shall be entirely the Contractor's responsibility. Rates for execution of work will be inclusive of supply of all these items.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
38 of 225

55.0 SAFETY PRECAUTIONS & HOT WORK:

55.1 The contractor shall also abide and strictly follow the safety norms of Lanka IOC PLC mentioned in the Tender with respect to International Standards which are applicable to the execution of whole scope of this Contract

55.2 PENALTY CLAUSE IN CASE OF BREACH OF SAFETY:

The penalty for breach of safety during execution of works shall be levied by the Corporation as below:

- Violation of applicable safety, health and environment related norm, a penalty of Rs 15,000/- per occasion.
- Violation as above resulting in.
 - Fatal accident, a penalty of 1% of the contract value (max. of LKR 10 lacs) per fatality in addition to Rs 15000/- as mentioned above.
 - Any physical injury, a penalty of 0.5% of the contract value (max. of LKR 2 lacs) per injury in addition to Rs 15000/- as mentioned above

In case of any breach of contract (other than price reduction clause for delayed completion) , recovery of requisite inclusive of tax amount over and above the penalty amount shall be done from the contractors bill.

55.3 When the whole of the works have been completed and have satisfactorily passed any final test that may be prescribed by the contract shall be deemed to be a request by the contractor for the Engineer to issue a certificate of completion in respect of the work. The Engineer will issue the final completion certificate (Copy of the certified final bill) after successful completion of the guarantee period of 01 year.

55.4 Sealed tenders should be deposited in the tender box provided **only** at the office of **Vice President (Engineering), Level 20, West Tower, World Trade Center, Echelon square, Colombo 01** before **12:00 Hrs on due date.**

VICE PRESIDENT (ENGG.)
LANKA IOC PLC,

I / We confirm that I / We have gone through the above conditions carefully and agree to abide by the same.

Signature of the Bidder

ADDRESS

DATE & SEAL

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
39 of 225**

TERMS & CONDITIONS – SAFETY

Since the works have to be carried out in Petroleum storage and distribution establishment, the contractors should ensure that day-to-day operations, safety & security of the location are not affected in any way on the account of the work being carried out. In case of any damage to LIOC properties due to negligence on the part of the contractor or their workmen, the contractor will be held responsible and liquidated damages as asserted by the corporation would be recovered from them.

When hot works are involved the following safety precautions have to be strictly observed before commencement of hot works.

- a. All hot works should be carried out under the supervision of LIOC representative and also under the supervision of a responsible representative of the contractor.
- b. All hot work operations should be undertaken only after issue of hot work permit by Site Engineer on a day to day basis.
- c. It should be ensured that the tanks, containers, pipelines etc. where hot work is required are gas free and properly checked to this effect with explosive meters.
- d. It should be ensured that surrounding area is free of oil rags, spillages and other sources of ignition and the area cleaned and sprinkled with dry sand / earth. It should also be ensured that metallic trays filled with DCP are kept for collecting the welding arc / hot metal cutting.
- e. Hot work should commence only after positioning the portable fire extinguishers and sand / dry powder in readiness at site and hydrant system made available at the nearest point.
- f. Match boxes, lighters etc. used for hot work should be kept in the custody of supervisor.
- g. If hot work has to be carried out in a place close to storage tanks or any other facility under operation, it is necessary to provide a screen wall made of AC sheets to segregate the area to prevent the sparks traveling to the hazardous area.
- h. It should be ensured that no workmen carry matchboxes or any other source of ignition with them while entering the premises or inside the premises. After the hot work operation of the day, the following precautions should be taken.
 - Welding sets should be switched off and the power mains disconnected. If the connection is taken from temporary switchboard, the fuse carriers should be removed and handed over to the supervisor.
 - Gas cylinders and cutting sets should be properly closed and the equipment removed to a safe place.
 - The site of work should be examined to ensure that it is free from hot splatters and any other source of ignition.
 - All the workmen of the contractor should be moved out of the premises.

**Vice President (Engg.)
Lanka IOC PLC**

**SIGNATURE OF TENDERER
SEAL**

**SAFETY PRACTICES DURING CONSTRUCTION****1.0 INTRODUCTION**

Safety in Construction Management deserves utmost attention especially in the hydrocarbon industry, such as Exploration, Refineries, Pipelines and Marketing installations, Gas Processing units etc. Construction is widely recognized as one of the accident-prone activities. Most of the accidents are caused by inadequate planning, failure during the construction process and/or because of design deficiencies. Besides property loss, accidents also result in injuries and fatalities to the personnel; same needs to be prevented.

The reasons for accidents during construction activities are related to unique nature of the industry, human behavior, difficult work-site conditions, extended odd duty hours, lack of training & awareness and inadequate safety management. Unsafe working methods, equipment failure and improper housekeeping also tend to increase the accident rate in construction.

Ensuring good quality materials, equipment and competent supervision along with compliance of standard engineering practices shall go a long way to build safety into the system.

The objective of this standard is to provide practical guidance on technical and educational framework for safety and health in construction with a view to:

- prevent accidents and harmful effects on the health of workers arising from employment in construction;
- ensure appropriate safety during implementation of construction;
- provide safety practice guidelines for appropriate measures of planning, control and enforcement.

2.0 SCOPE

This document specifies broad guidelines on safe practices to be adhered to during construction activities in oil industry. However, before commencing any job, specific hazards and its effects should be assessed, and necessary corrective/preventive actions should be taken by all concerned. The document is intended only to supplement and not to replace or supersede the prevailing statutory requirements, which shall also be followed as applicable. The scope of this document does not include the design aspects and quality checks during construction.

3.0 DEFINITION

Definitions of various terminology are given below:

- Adequate, appropriate or suitable are used to describe qualitatively or quantitatively the means or method used to protect the worker.

SIGNATURE OF TENDERER
SEAL



- **Brace:** A structural member that holds one point in a fixed position with respect to another point; bracing is a system of structural members designed to prevent distortion of a structure.
- **By hand:** The work is done without the help of a mechanised tool.
- **Competent Authority:** A statutory agency having the power to issue regulations, orders or other instructions having the force of law.
- **Competent person:** A person possessing adequate qualifications, such as suitable training and sufficient knowledge, experience and skill for the safe performance of the specific work. The competent authorities may define appropriate criteria for the designation of such persons and may determine the duties to be assigned to them.
- **Execution agency:**
- Any physical or legal person, having contractual obligation with the owner, and who employs one or more workers on a construction site
- **Owner:**
- Any physical or legal person for whom construction job is carried out.
- It shall also include owner's designated representative/ consultant/ nominee/agent, authorized from time to time to act for and on its behalf, for supervising/ coordinating the activities of the execution agency.
- **Hazard:** Danger or potential danger.
- **Guard-rail:** An adequately secured rail erected along an exposed edge to prevent persons from falling.
- **Hoist:** A machine, which lifts materials or persons by means of a platform, which runs on guides.
- **Lifting gear:** Any gear or tackle by means of which a load can be attached to a lifting appliance but which does not form an integral part of the appliance or load.
- **Lifting appliance:** Any stationary or mobile appliance used for raising or lowering persons or loads.
- **Means of access or egress:** Passageways, corridors, stairs, platforms, ladders and any other means for entering or leaving the workplace or for escaping in case of danger.
- **Scaffold:** Any fixed, suspended or mobile temporary structure supporting workers and material or to gain access to any such structure and which is not a lifting appliance as defined above.
- **Toe-board:** A barrier placed along the edge of a scaffold platform, runway, etc., and secured there to guard against the slipping of persons or the falling of material.
- **Worker:** Any person engaged in construction activity.
- **Workplace:** All places where workers need to be or to go by reason of their work.

4.0 GENERAL DUTIES

4.1 GENERAL DUTIES OF EXECUTION AGENCIES

4.1.1 Execution agency should:

- Provide means and organization to comply with the safety and health measures required at the workplace.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
42 of 225**

- Provide and maintain places, plant, equipment, tools and machinery and organize construction work so that, there is no risk of accident or injury to health of workers. Construction work should be planned, prepared and undertaken so that:
 - a) dangers, liable to arise at the workplace, are prevented;
 - b) excessively or unnecessarily strenuous work positions and movements are avoided;
 - c) organisation of work takes into account the safety and health of workers;
 - d) materials and products used are suitable from a safety and health point of view;
 - e) working methods are adopted to safeguard workers against the harmful effects of chemical, physical and biological agents.
- Establish committees with representatives of workers and management or make other arrangements for the participation of workers in ensuring safe working conditions.
- Arrange for periodic safety inspections by competent persons of all buildings, plant, equipment, tools, machinery, workplaces and review of systems of work, regulations, standards or codes of practice. The competent person should examine and ascertain the safety of construction machinery and equipment.
- Provide such supervision to ensure that workers perform their work with due regard to safety and health of theirs as well as that of others.
- Employ only those workers who are qualified, trained and suited by their age, physique, state of health and skill.
- Satisfy themselves that all workers are informed and instructed in the hazards connected with their work and environment and trained in the precautions necessary to avoid accidents and injury to health.
- Ensure that buildings, plant, equipment, tools, machinery or workplaces in which a dangerous defect has been found should not be used until the defect has been rectified.
- Organise for and remain always prepared to take immediate steps to stop the operation and evacuate workers as appropriate, where there is an imminent danger to the safety of workers.
- establish a checking system by which it can be ascertained that all the members of a shift, including operators of mobile equipment, have returned to the camp or base at the close of work on dispersed sites and where small groups of workers operate in isolation.
- Provide appropriate first aid, training and welfare facilities to workers and, whenever collective measures are not feasible or are insufficient, provide and maintain personal protective equipment and clothing in line with the requirement. They should also provide access to workers to occupational health services.
- Educate workers about their right and the duty at any workplace to participate in ensuring safe working conditions to the extent of their control over the equipment and methods of work and to express views on working procedures adopted as may affect safety and health.
- Ensure that except in an emergency, workers, unless duly authorised, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.
- Ensure that workers do not operate or interfere with plant and equipment that they have not been duly authorised to operate, maintain or use.
- Ensure that workers do not sleep, rest or cook etc in dangerous places such as scaffolds, railway tracks, garages, confined spaces or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment etc.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
43 of 225

- Obtain the necessary clearance/permits as required and specified by owner.

4.2 GENERAL DUTIES OF OWNERS

4.2.1 Owners should:

- co-ordinate or nominate a competent person to co-ordinate all activities relating to safety and health on their construction projects;
- inform all contractors on the project of special risks to health and safety;
- Ensure that executing agency is aware of the owner's requirements and the executing agency's responsibilities with respect to safety practices before starting the job.

5.0 SAFETY PRACTICES AT WORK PLACES

5.1 GENERAL PROVISIONS

- All openings and other areas likely to pose danger to workers should be clearly indicated.
- Workers & Supervisors should use the safety helmet and other requisite Personal Protective Equipment according to job & site requirement. They should be trained to use personal protective equipment.
- Never use solvents, alkalis and other oils to clean the skin.
- Lift the load with back straight and knees bent as far as possible. Seek the help in case of heavy load.
- Ensure the usage of correct and tested tools and tackles. Don't allow the make shift tools and tackles.
- **No loose clothing should be allowed while working near rotating equipment or working at heights.**

5.2 MEANS OF ACCESS AND EGRESS

Adequate and safe means of access (atleast two, differently located) to and egress from all workplaces should be provided. Same should be displayed and maintained.

5.3 HOUSEKEEPING

5.3.1 Ensure:

- Proper storage of materials and equipment;
- Removal of scrap, inflammable material, waste and debris at appropriate intervals.

5.3.2 Removal of loose materials, which are not required for use, to be ensured. Accumulation of these at the site can obstruct means of access to and egress from workplaces and passageways.

5.3.3 Workplaces and passageways, that are slippery owing to oil, grease or other causes, should be cleaned up or strewn with sand, sawdust, ash etc.

5.4 PRECAUTIONS AGAINST THE FALL OF MATERIALS & PERSONS AND COLLAPSE OF STRUCTURES

SIGNATURE OF TENDERER
SEAL



- 5.4.1 Precautions should be taken such as the provision of fencing, look-out men or barriers to protect any person against injury by the fall of materials, or tools or equipment being raised or lowered.
- 5.4.2 Where necessary to prevent danger, guys, stays or supports should be used or other effective precautions should be taken to prevent the collapse of structures or parts of structures that are being erected, maintained, repaired, dismantled or demolished.
- 5.4.3 All openings through which workers are liable to fall should be kept effectively covered or fenced and displayed prominently.
- 5.4.4 As far as practicable, guardrails and toe-boards should be provided to protect workers from falling from elevated workplaces.
- 5.5 PREVENTION OF UNAUTHORISED ENTRY
- 5.5.1 Construction sites located in built-up areas and alongside vehicular and pedestrian traffic routes should be fenced to prevent the entry of unauthorised persons.
- 5.5.2 **Visitors should not be allowed access to construction sites unless accompanied by or authorised by a competent person and provided with the appropriate protective equipment.**
- 5.6 FIRE PREVENTION AND FIRE FIGHTING
- 5.6.1 **All necessary measures should be taken by the executing agency and owner to:**
- **Avoid the risk of fire;**
 - **Control quickly and efficiently any outbreak of fire;**
 - **Bring out a quick and safe evacuation of persons.**
 - **Inform unit/fire station control room, where construction work is carried out within existing operating area.**
- 5.6.2 Combustible materials such as packing materials, sawdust, greasy/oily waste and scrap wood or plastics should not be allowed to accumulate in workplaces but should be kept in closed metal containers in a safe place.
- 5.6.3 Places where workers are employed should, if necessary to prevent the danger of fire, be provided with:
- Suitable and sufficient fire-extinguishing equipment, which should be easily visible and accessible;
 - An adequate water supply at sufficient pressure meeting the requirements.
- 5.6.4 To guard against danger at places having combustible material, workers should be trained in the action to be taken in the event of fire, including the use of means of escape.



5.6.5 At sites having combustible material, suitable visual signs should be provided to indicate clearly the direction of escape in case of fire.

5.6.6 Means of escape should be kept clear at all times. Escape routes should be frequently inspected particularly in high structures and where access is restricted.

5.7 LIGHTING

5.7.1 Where natural lighting is not adequate, working light fittings or portable hand-lamps should be provided at workplace on the construction site where a worker will do a job.

5.7.2 Emergency lighting should be provided for personnel safety during night time to facilitate standby lighting source, if normal system fails.

5.7.3 Artificial lighting should not produce glare or disturbing shadows.

5.7.4 Lamps should be protected by guards against accidental breakage.

5.7.5 The cables of portable electrical lighting equipment should be of adequate size & characteristics for the power requirements and of adequate mechanical strength to withstand severe conditions in construction operations.

5.8 PLANT, MACHINERY, EQUIPMENT AND HAND TOOLS

5.8.1 General Provisions

- Plant, machinery and equipment including hand tools, both manual and power driven, should:
 - a) Be of proper design and construction, considering health, Safety and ergonomic principles.
 - b) Be maintained in good working order;
 - c) Be used only for work for which they have been designed.
 - d) Be operated only by workers who have been authorised and given appropriate training.
 - e) Be provided with protective guards, shields or other devices as required.
- Adequate instructions for safe use should be provided.
- Safe operating procedures should be established and used for all plants, machinery and equipment.
- Operators of plant, machinery and equipment should not be distracted while work is in progress.
- Plant, machinery and equipment should be switched off when not in use and isolated before any adjustment, clearing or maintenance is done.
- Where trailing cables or hose pipes are used they should be kept as short as practicable and not be allowed to create a hazard.
- All moving parts of machinery and equipment should be enclosed or adequately guarded.
- Every power-driven machine and equipment should be provided with adequate means, immediately accessible and readily identifiable to the operator, of stopping it quickly and preventing it from being started again inadvertently.

SIGNATURE OF TENDERER
SEAL



- Operators of plant, machinery, equipment and tools should be provided with PPEs, including where necessary, suitable ear protection.

5.8.2 Hand tools

- Hand tools should be repaired by competent persons.
- Heads of hammers and other shock tools should be dressed or ground to a suitable radius on the edge as soon as they begin to mushroom or crack.
- When not in use and while being carried or transported sharp tools should be kept in sheaths, shields, chests or other suitable containers.
- Only insulated or non conducting tools should be used on or near live electrical installations.
- Only non-sparking tools should be used near or in the presence of flammable or explosive dusts or vapours.

5.8.3 Pneumatic Tools

- Operating triggers on portable pneumatic tools should be:
 - a) So placed as to minimise the risk of accidental starting of the machine.
 - b) So arranged as to close the air inlet valve automatically when the pressure of the operator's hand is removed.
- Hose and hose connections for compressed air supply to portable pneumatic tools should be:
 - a) Designed and tested for the pressure and service for which they are intended;
 - b) Fastened securely on the pipe outlet and equipped with the safety chain, as appropriate.
- Pneumatic shock tools should be equipped with safety clips or retainers to prevent dies and tools from being accidentally expelled from the barrel.
- Pneumatic tools should be disconnected from power and the pressure in hose lines released before any adjustment or repair is made.

5.8.4 Electrical Tools

- Low voltage portable electrical tools should generally be used.
- All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.
- All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept.

5.8.5 Engines

- Engines should:
 - a) Be installed so that they can be started safely and the maximum safe speed cannot be exceeded.
 - b) Have controls for limiting speed.
 - c) Have devices to stop them from a safe place in an emergency.
- IC engines should not be run in confined spaces unless adequate exhaust ventilation is provided.

SIGNATURE OF TENDERER
SEAL



- When IC engines are being fuelled:
 - a) The engine should be shut off.
 - b) care should be taken to avoid spilling fuel;
 - c) No person should smoke or have naked light in the vicinity.
 - d) A fire extinguisher should be kept readily available.
- Secondary fuel reservoir should be placed outside the engine room.

6.0 CONSTRUCTION ACTIVITIES

The various common activities in construction are as under:

- Excavation
- Scaffolding, Platforms & Ladders
- Structural Work, Laying of Reinforcement & Concreting
- Road Work (Laying of roads)
- Cutting /Welding
- Working in Confined Space
- Proof/Pressure Testing
- Working at Heights
- Handling & Lifting Equipments
- Vehicle Movement
- Electrical
- Demolition
- Sand/shot blasting/ spray painting

The safe practices to be followed during the implementation of above construction activities are given below:

6.1 EXCAVATION

6.1.1 All excavation work should be planned and the method of excavation and the type of support work required should be decided considering the following:

- The stability of the ground;
- The excavation will not affect adjoining buildings, structures or roadways;
- To prevent hazard, the gas, water, electrical and other public utilities should be shut off or disconnected, if necessary;
- Presence of underground pipes, cable conductors, etc.,
- The position of culvert/bridges, temporary roads and spoil heaps should be determined;

6.1.2 Before digging begins on site, all excavation work should be planned and the method of excavation and the type of support work required decided.

6.1.3 All excavation work should be supervised.

6.1.4 Sites of excavations should be thoroughly inspected:

- Daily, prior to each shift and after interruption in work of more than one day;
- After every blasting operation;

SIGNATURE OF TENDERER
SEAL



- After an unexpected fall of ground;
- After substantial damage to supports;
- After a heavy rain, frost or snow;
- When boulder formations are encountered.

- 6.1.5 Safe angle of repose while excavating trenches exceeding 1.5m depth upto 3.0m should be maintained. Based on site conditions, provide proper slope, usually 45°, and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock or provide proper shoring and strutting to prevent cave-in or slides.
- 6.1.6 As far as possible, excavated earth should not be placed within one meter of the edge of the trench or depth of trench whichever is greater.
- 6.1.7 Don't allow vehicles to operate too close to excavated area. Maintain atleast 2m distance from edge of excavation. No load, plant or equipment should be placed or moved near the edge of any excavation where it is likely to cause its collapse and thereby endanger any person unless precautions such as the provision of shoring or piling are taken to prevent the sides from collapsing.
- 6.1.8 Adequately anchored stop blocks and barriers should be provided to prevent vehicles being driven into the excavation. Heavy vehicles should not be allowed near the excavation unless the support work has been specially designed to permit it.
- 6.1.9 If an excavation is likely to affect the security of a structure on which persons are working, precautions should be taken to protect the structure from collapse.
- 6.1.10 Barricade at 1m height (with red & white band/self glowing caution board) should be provided for excavations beyond 1.5m depth. Provide two entries/exits for such excavation.
- 6.1.11 Necessary precautions should be taken for underground utility lines like cables; sewers etc. and necessary approvals/clearances from the concerned authorities shall be obtained before commencement of the excavation job.
- 6.1.12 Water shall be pumped/ bailed out, if any accumulates in the trench. Necessary precautions should be taken to prevent entry of surface water in trenches.
- 6.1.13 During rains, the soil becomes loose. Take additional precaution against collapse of side wall.
- 6.1.14 In hazardous areas, air should be tested to ascertain its quality. No one should be allowed entry till it is suitable for breathing.
- 6.1.15 In case of mechanised excavation, precaution shall be taken to not to allow anybody to come within one meter of extreme reach of the mechanical shovel. The mechanised excavator shall be operated by a well-trained experienced operator. When not in operation, the machine shall be kept on firm leveled ground with mechanical shovel resting on ground. Wheel or belt shall be suitably jammed to prevent any accidental movement of the machine. Suitable precautions as per manufacturer guidelines should be taken for dozers, graders and other heavy machines.

SIGNATURE OF TENDERER
SEAL



6.1.16 In case of blasting, follow strictly rules for storage, handling and carrying of explosive materials and execution of blasting operation.

6.2 SCAFFOLDING, PLATFORMS & LADDERS

6.2.1 Metal as material of construction

- A scaffold should be provided and maintained or other equally safe and suitable provision should be made where work cannot safely be done on or from the ground or from part of a building or other permanent structure.
- Scaffolds should be provided with safe means of access, such as stairs, ladders or ramps. Ladders should be secured against inadvertent movement.
- Every scaffold should be constructed, erected and maintained so as to prevent collapse or accidental displacement when in use.
- Every scaffold and part thereof should be constructed :
 - a) In such a way so as not to cause hazards for workers during erection and dismantling;
 - b) In such a way so as guard rails and other protective devices, platforms, ladders, stairs or ramps can be easily put together;
 - c) With sound material and of requisite size and strength for the purpose for which it is to be used and maintained in a proper condition.
- Boards and planks used for scaffolds should be protected against splitting.
- Materials used in the construction of scaffolds should be stored under good conditions and apart from any material unsuitable for scaffolds.
- Couplers should not cause deformation in tubes. Couplers should be made of drop forged steel or equivalent material.
- Tubes should be free from cracks, splits and excessive corrosion and be straight to the eye, and tube ends cut cleanly square with the tube axis.
- Scaffolds should be designed for their maximum load as per relevant code.
- Scaffolds should be adequately braced.
- Scaffolds which are not designed to be independent should be rigidly connected to the building at designated vertical and horizontal places.
- A scaffold should never extend above the highest anchorage to an extent which might endanger its stability and strength.
- Loose bricks, drainpipes, chimney-pots or other unsuitable material should not be used for the construction or support of any part of a scaffold.
- Scaffolds should be inspected and certified:
 - a) Before being taken into use;
 - b) At periodic intervals thereafter as prescribed for different types of scaffolds;
 - c) After any alteration, interruption in use, exposure to weather or seismic conditions or any other occurrence likely to have affected their strength or stability.
- Inspection should more particularly ascertain that:
 - a) The scaffold is of suitable type and adequate for the job;
 - b) Materials used in its construction are sound and of sufficient strength;**
 - c) It is of sound construction and stable;
 - d) That the required safeguards are in position.
- A scaffold should not be erected, substantially altered or dismantled except by or under the supervision.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
50 of 225**

- Every scaffold should be maintained in good and proper condition, and every part should be kept fixed or secured so that no part can be displaced in consequence of normal use.
- If out-rigger scaffolding is to be used, it should be specifically designed and inspected before putting in use.

6.2.2 Lifting appliances on scaffolds

- When a lifting appliance is to be used on a scaffold:
 - a) the parts of the scaffold should be carefully inspected to determine the additional strengthening and other safety measures required;
 - b) any movement of the scaffold members should be prevented;
 - c) if practicable, the uprights should be rigidly connected to a solid part of the building at the place where the lifting appliance is erected.

6.2.3 Prefabricated scaffolds

- In the case of prefabricated scaffold systems, the instructions provided by the manufacturers or suppliers should be strictly adhered to. Prefabricated scaffolds should have adequate arrangements for fixing bracing.
- Frames of different types should not be intermingled in a single scaffold.
- Scaffolding shall be erected on firm and level ground.
- All members of metal scaffolding shall be checked periodically to screen out defective / rusted members. All joints should be properly lubricated for easy tightening.
- Entry to scaffolding should be restricted.
- Erection, alteration and removal shall be done under supervision of experienced personnel.
- Use of barrels, boxes, loose bricks etc., for supporting platform shall not be permitted.
- Each supporting member of platform shall be securely fastened and braced
- Where planks are butt-joined, two parallel putlogs shall be used, not more than 100mm apart, to give support to each plank.
- Platform plank shall not project beyond its end support to a distance exceeding 4 times the thickness of plank, unless it is effectively secured to prevent tipping. Cantilever planks should be avoided.
- The platform edges shall be provided with 150mm high toe board to eliminate hazards of tools or other objects falling from platform.
- Erect ladders in the "four up-one out position"
- Lash ladder securely with the structure.
- Using non-slip devices, such as, rubber shoes or pointed steel ferules at the ladder foot, rubber wheels at ladder top, fixing wooden battens, cleats etc.
- When ladder is used for climbing over a platform, the ladder must be of sufficient length, to extend at least one meter above the platform, when erected against the platform in "four up-one out position."
- Portable ladders shall be used for heights not more than 4mt. Above 4mt flights, fixed ladders shall be provided with at least 600 mm landings at every 6mt or less.
- The width of ladder shall not be less than 300mm and rungs shall be spaced not more than 300mm.
- Every platform and means of access shall be kept free from obstruction.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
51 of 225**

- If grease, mud, gravel, mortar etc., fall on platform or scaffolds, these shall be removed immediately to avoid slippage.
- Workers shall not be allowed to work on scaffolds during storms or high wind. After heavy rain or storms, scaffolds shall be inspected before reuse.
- Don't overload the scaffolding. Remove excess material and scrap immediately.
- Dismantling of scaffolds shall be done in a pre-planned sequential manner.

6.2.4 Suspended scaffolds/boatswain's chair

- In addition to the requirements for scaffolds in general as regards soundness, stability and protection against the risk of falls, suspended scaffolds should meet the following specific requirements.
 - a) Platforms should be designed and built with dimensions that are compatible with the stability of the structure as a whole, especially the length;
 - b) The number or anchorage should be compatible with the dimensions of the platform;
 - c) The safety of workers should be safeguarded by an extra rope having a point of attachment independent of the anchorage arrangements of the scaffold;
 - d) The anchorage and other elements of support of the scaffold should be designed and built in such a way as to ensure sufficient strength;
 - e) The ropes, winches, pulleys or pulley blocks should be designed, assembled, used and maintained according to the requirements established for lifting gear adapted to the lifting of persons according to national laws and regulations;
 - f) Before use, the whole structure should be checked by a competent person.

6.2.5 Bamboo Scaffolding

- In general, it should be avoided as far as possible. It should not be used in the unit/off-site areas and where hot work is to be done.

6.3 STRUCTURAL WORK, LAYING OF REINFORCEMENT & CONCRETING

6.3.1 General provisions

- The erection or dismantling of buildings, structures, civil engineering works, formwork, falsework and shoring should be carried out by trained workers only under the supervision of a competent person.
- Precautions should be taken to guard against danger to workers arising from any temporary state of weakness or instability of a structure.
- Formwork, falsework and shoring should be so designed, constructed and maintained that it will safely support all loads that may be imposed on it.
- Formwork should be so designed and erected that working platforms, means of access, bracing and means of handling and stabilising are easily fixed to the formwork structure.

6.3.2. Erection and dismantling of steel and prefabricated structures

- The safety of workers employed on the erection and dismantling of steel and prefabricated structures should be ensured by appropriate means, such as provision and use of:
 - a) Ladders, gangways or fixed platforms;

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
52 of 225**

- b) Platforms, buckets, boatswain's chairs or other appropriate means suspended from lifting appliances;
 - c) Safety harnesses and lifelines, catch nets or catch platforms;
 - d) Power-operated mobile working platforms.
- Steel and prefabricated structures should be so designed and made that they can be safely transported and erected.
- In addition to the need for the stability of the part when erected, the design should explicitly take following into account:
 - a) The conditions and methods of attachment in the operations of transport, storing and temporary support during erection or dismantling as applicable;
 - b) Methods for the provision of safeguards such as railings and working platforms, and, when necessary, for mounting them easily on the structural steel or prefabricated parts.
- The hooks and other devices built in or provided on the structural steel or prefabricated parts that are required for lifting and transporting them should be so shaped, dimensioned and positioned as:
 - a) To withstand with a sufficient margin the stresses to which they are subjected;
 - b) Not to set up stresses in the part that could cause failures, or stresses in the structure itself not provided for in the plans, and be designed to permit easy release from the lifting appliance. Lifting points for floor and staircase units should be located (recessed if necessary) so that they do not protrude above the surface;
 - c) To avoid imbalance or distortion of the lifted load.
- Storeplaces should be so constructed that:
 - a) There is no risk of structural steel or prefabricated parts falling or overturning;
 - b) Storage conditions generally ensure stability and avoid damage having regard to the method of storage and atmospheric conditions;
 - c) Racks are set on firm ground and designed so that units cannot move accidentally.
- While they are being stored, transported, raised or set down, structural steel or prefabricated parts should not be subjected to stresses prejudicial to their stability.
- Every lifting appliance should:
 - a) Be suitable for the operations and not be capable of accidental disconnection;
 - b) Be approved or tested as per statutory requirement.
- Lifting hooks should be of the self-closing type or of a safety type and should have the maximum permissible load marked on them.
- Tongs, clamps and other appliances for lifting structural steel and prefabricated parts should:
 - a) Be of such shape and dimensions as to ensure a secure grip without damaging the part;
 - b) Be marked with the maximum permissible load in the most unfavourable lifting conditions.
- Structural steel or prefabricated parts should be lifted by methods or appliances that prevent them from spinning accidentally.
- When necessary to prevent danger, before they are raised from the ground, structural steel or prefabricated parts should be provided with safety devices such as railings and working platforms to prevent falls of persons.
- While structural steel or prefabricated parts are being erected, the workers should be provided with appliances for guiding them as they are being lifted and set down, so as to

**SIGNATURE OF TENDERER
SEAL**

avoid crushing of hands and to facilitate the operations. Use of such appliances should be ensured.

- A raised structural steel or prefabricated part should be so secured and wall units so propped that their stability cannot be imperiled, even by external agencies such as wind and passing loads before its release from the lifting appliance.
- At work places, instruction should be given to the workers on the methods, arrangements and means required for the storage, transport, lifting and erection of structural steel or prefabricated parts, and, before erection starts, a meeting of all those responsible should be held to discuss and confirm the requirements for safe erection.
- During transportation within the construction area, attachments such as slings and stirrups mounted on structural steel or prefabricated parts should be securely fastened to the parts.
- Structural steel or prefabricated parts should be so transported that the conditions do not affect the stability of the parts or the means of transport result in jolting, vibration or stresses due to blows, or loads of material or persons.
- When the method of erection does not permit the provision of other means of protection against fall of persons, the workplaces should be protected by guardrails, and if appropriate by toe-boards.
- When adverse weather conditions such as snow, ice and wind or reduced visibility entail risks of accidents, the work should be carried on with particular care, or, if necessary, interrupted.
- Structures should not be worked on during violent storms or high winds, or when they are covered with ice or snow, or are slippery from other causes.
- If necessary, to prevent danger, structural steel parts should be equipped with attachments for suspended scaffolds, lifelines or safety harnesses and other means of protection.
- The risks of falling, to which workers moving on high or sloping girders are exposed, should be limited by all means of adequate collective protection or, where this is impossible, by the use of a safety harness that is well secured to a strong support.
- Structural steel parts that are to be erected at a great height should as far as practicable be assembled on the ground.
- When structural steel or prefabricated parts are being erected, a sufficiently extended area underneath the place should be barricaded or guarded
- Steel trusses that are being erected should be adequately shored, braced or guyed until they are permanently secured in position.
- Load-bearing structural member should not be dangerously weakened by cutting, holing or other means.
- Structural members should not be forced into place by the hoisting machine while any worker is in such a position that he could be injured by the operation.
- Open-web steel joists that are hoisted singly should be directly placed in position and secured against dislodgment.

6.3.3 Reinforcement

- Ensure that workers use Personnel Protective equipment like safety helmet, safety shoes, gloves etc.
- Don't place the hand below the rods for checking clear distance. Use measuring devices.
- Don't wear loose clothes while checking the rods.
- Don't stand unnecessarily on cantilever rods.
- For supplying of rods at heights, proper staging and/or bundling to be provided.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
54 of 225**

- Ensure barricading and staging for supplying and fixing of rods at height.
- For short distance carrying of materials on shoulders, suitable pads to be provided.
- While transporting material by trucks/trailers, the rods shall not protrude in front of or by the sides of driver's cabin. In case such protrusion cannot be avoided behind the deck, then it should not extend $1/3^{rd}$ of deck length or 1.5M whichever is less and tied with red flags/lights.

6.3.4 Concreting

- Ensure stability of shuttering work before allowing concreting.
- Barricade the concreting area while pouring at height/depths.
- Keep vibrator hoses, pumping concrete accessories in healthy conditions and mechanically locked.
- Pipelines in concrete pumping system shall not be attached to temporary structures such as scaffolds and formwork support as the forces and movements may effect their integrity.
- Check safety cages & guards around moving motors/parts etc. provided in concreting mixers.
- Use Personal Protective Equipment like gloves, safety shoes etc. while dealing with concrete and wear respirators for dealing with cement.
- Earthing of electrical mixers, vibrators, etc. should be done and verified.
- Cleaning of rotating drums of concrete mixers shall be done from outside. Lockout devices shall be provided where workers need to enter.
- Where concrete mixers are driven by internal combustion engine, exhaust points shall be located away from the worker's workstation so as to eliminate their exposure to obnoxious fumes.
- Don't allow unauthorised person to stand under the concreting area.
- Ensure adequate lighting arrangements for carrying out concrete work during night.
- Don't allow the same workers to pour concrete round the clock. Insist on shift pattern.
- During pouring, shuttering and its supports should be continuously watched for defects.

6.4 ROAD WORK

- 6.4.1 Site shall be barricaded and provided with warning signs, including night warning lamps at appropriate locations for traffic diversion.
- 6.4.2 Filled and empty bitumen drums shall be stacked separately at designated places.
- 6.4.3 Mixing aggregate with bitumen shall preferably be done with the help of bitumen batch mixing plant, unless operationally non-feasible.
- 6.4.4 Road rollers, Bitumen sprayers, Pavement finishers shall be driven by experienced drivers with valid driving license.
- 6.4.5 Workers handling hot bitumen sprayers or spreading bitumen aggregate mix or mixing bitumen with aggregate shall be provided with PVC hand gloves and rubber shoes with legging up to knee joints.
- 6.4.6 At the end of day's work, surplus hot bitumen in tar boiler shall be properly covered by a metal

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
55 of 225**

sheet, to prevent anything falling in it.

- 6.4.7 If bitumen accidentally falls on ground, it shall be immediately covered by sprinkling sand, to prevent anybody stepping on it. Then it shall be removed with the help of spade.

6.5 CUTTING/WELDING

- 6.5.1 Common hazards involved in welding/cutting are sparks, molten metal, flying particles, harmful light rays, electric shocks etc. Following precautions should be taken: -

- A dry chemical type fire extinguisher shall be made available in the work area.
- Adequate ventilation shall be ensured by opening manholes and fixing a shield or forced circulation of air etc, while doing a job in confined space.
- Ensure that only approved and well-maintained apparatus, such as torches, manifolds, regulators or pressure reducing valves, and acetylene generators, be used.
- All covers and panels shall be kept in place, when operating an electric Arc welding machine.
- The work piece should be connected directly to Power supply, and not indirectly through pipelines/structures/equipments etc.
- The welding receptacles shall be rated for 63 A suitable for 415V, 3-Phase system with a scraping earth. Receptacles shall have necessary mechanical interlocks and earthing facilities.
- All cables, including welding and ground cables, shall be checked for any worn out or cracked insulation before starting the job. Ground cable should be separate without any loose joints.
- Cable coiling shall be maintained at minimum level, if not avoidable.
- An energised electrode shall not be left unattended.
- The power source shall be turned off at the end of job.
- All gas cylinders shall be properly secured in upright position.
- Acetylene cylinder shall be turned and kept in such a way that the valve outlet points away from oxygen cylinder.
- Acetylene cylinder key for opening valve shall be kept on valve stem, while cylinder is in use, so that the acetylene cylinder could be quickly turned off in case of emergency. Use flash back arrestors to prevent back-fire in acetylene/oxygen cylinder.
- When not in use, valves of all cylinders shall be kept closed.
- All types of cylinders, whether full or empty, shall be stored at cool, dry place under shed.
- Forced opening of any cylinder valve should not be attempted.
- Lighted gas torch shall never be left unattended.
- Store acetylene and oxygen cylinders separately.
- Store full and empty cylinders separately.
- Avoid cylinders coming into contact with heat.
- Cylinders that are heavy or difficult to carry by hand may be rolled on their bottom edge but never dragged.
- If cylinders have to be moved, be sure that the cylinder valves are shut off.
- Before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose.
- Do not use matches to light torches, use a friction lighter.
- Move out any leaking cylinder immediately.
- Use trolleys for oxygen & acetylene cylinder and chain them.

**SIGNATURE OF TENDERER
SEAL**



- Always use Red hose for acetylene and other fuel gases and Black for oxygen, and ensure that both are in equal length.
- Ensure that hoses are free from burns, cuts and cracks and properly clamped.
- Avoid dragging hoses over sharp edges and objects
- Do not wrap hoses around cylinders when in use or stored.
- Protect hoses from flying sparks, hot slag, and other hot objects.
- Lubricants shall not be used on Ox-fuel gas equipment.
- During cutting/welding, use proper type goggles/ face shields.

6.6 WORKING IN CONFINED SPACES

6.6.1 Following safety practices for working in confined space like towers, columns, tanks and other vessels should be followed in addition to the safety guidelines for specific jobs like scaffolding, cutting/welding etc.

- Shut down, isolate, depressurise and purge the vessel as per laid down procedures.
- Ensure proper and accessible means of exit before entry inside a confined space.
- The number of persons allowed inside the vessel should be limited to avoid overcrowding.
- When the work is going on in the confined space, there should always be one man standby at the nearby manway.
- Before entering inside the vessels underground or located at lower elevation, probability of dense vapours accumulating nearby should also be considered in addition to inside the vessel.
- Ensure requisite O₂ level before entry in the confined space and monitor level periodically or other wise use respiratory devices.
- Check for no Hydrocarbon or toxic substances before entry and monitor level periodically or use requisite Personal Protective Equipment.
- Ensure adequate ventilation or use respiratory devices.
- Depending upon need, necessary respirator system, gas masks and suit shall be worn by everyone entering confined space. In case of sewer, OWS or in the confined area where there is a possibility of toxic or inert gas, gas masks shall be used by everyone while entering.
- Barricade the confined spaces during hoisting, radiography, blasting, pressure testing etc.
- Use 24V flameproof lamp fittings only for illumination.
- Use tools with air motors or electric tools with maximum voltage of 24V.
- House keeping shall be well maintained.
- Safety helmet, safety shoes and safety belt shall be worn by everyone entering the confined space.
- Don't wear loose clothing while working in a confined space.
- In case of the vessels which are likely to contain pyrophoric substances (like Iron Sulphide), special care need to be taken before opening the vessel. Attempt should be made to remove the pyrophoric substances. Otherwise, these should be always kept wet by suitable means.
- The cutting torches should also be kept outside the vessel immediately after the cutting.
- The gas cylinders used for cutting/welding shall be kept outside.
- All cables, hoses, welding equipment etc., shall be removed from confined space at end of each work day, even if the work is to be resumed in the same space the next day.
- To the extent possible sludge shall be cleared and removed from outside before entering.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
57 of 225**

- No naked light or flame or hot work such as welding, cutting and soldering should be permitted inside a confined space or area unless it has been made completely free of the flammable atmosphere, tested and found safe by a competent person. Only non-sparking tools and flameproof hand lamps protected with guard and safety torches should be used inside such confined space or area for initial inspection, cleaning or other work required to be done for making the area safe.
- Communication should be always maintained between the worker and the attendant.

6.7 PROOF/PRESSURE TESTING

- 6.7.1 Review test procedure before allowing testing with water or air or any other fluid.
- 6.7.2 Provide relief valves of adequate size while testing with air or other gases.
- 6.7.3 Ensure compliance of necessary precautions, step wise loading, tightening of fasteners, grouting etc. before and during testing.
- 6.7.4 Inform all concerned in advance of the testing.
- 6.7.5 Keep the vents open before opening any valve for filling/draining of liquid used for hydrotesting. The filling/draining should not exceed the designed rate for pressure testing.
- 6.7.6 Provide separate gauges of suitable range for pressurising pump and the equipment to be tested.
- 6.7.7 Provide gauges at designated locations for monitoring of pressures.
- 6.7.8 Check the calibration of all pressurising equipment and accessories and maintain records.
- 6.7.9 Take readings at pre-defined intervals.

6.8 WORKING AT HEIGHTS

6.8.1 General Provision

- While working at a height of more than 3 meters, approved safety belt shall be used.
- While working at a height of more than 3 meters, permit should be issued by competent person before commencement of the job.
- Worker should be well trained on usage of safety belt including its proper usage at the time of ascending/descending.
- All tools should be carried in tool kits to avoid their falling.
- If the job is on fragile/sloping roof, roof walk ladders shall be used.
- Provide lifeline wherever required.
- Additional safety measures like providing Fall Arrestor type Safety belt, safety net should be provided depending upon site conditions, job requirements.
- Keep working area neat and clean. Remove scrap material immediately.
- Don't throw or drop material/equipment from height.
- Avoid jumping from one member to another. Use proper passageway.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
58 of 225**

- Keep both hands free while climbing. Don't try to bypass the steps of the ladder.
- Try to maintain calm at height. Avoid over exertion.
- Avoid movements on beam.
- Elevated workplaces including roofs should be provided with safe means of access and egress such as stairs, ramps or ladders.

6.8.2 Roof Work

- All roof-work operations should be pre-planned and properly supervised.
- Roof work should only be undertaken by workers who are physically and psychologically fit and have the necessary knowledge and experience for such work.
- Work on roofs shouldn't be carried on in weather conditions that threaten the safety of workers.
- Crawling boards, walkways and roof ladders should be securely fastened to a firm structure.
- Roofing brackets should fit the slope of the roof and be securely supported.
- Where it is necessary for a person to kneel or crouch near the edge of the roof, necessary precautions should be taken.
- On a large roof where work have to be carried out at or near the edge, a simple barrier consisting of crossed scaffold tubes supporting a tubing guardrail may be provided.
- All covers for openings in roofs should be of substantial construction and be secured in position.
- Roofs with a pitch of more than 10 should be treated as sloping.
- When work is being carried out on sloping roofs, sufficient and suitable crawling boards or roof ladders should be provided and firmly secured in position.
- During extensive work on the roof, strong barriers or guardrails and toe-boards should be provided to stop a person from falling off the roof.
- Where workers are required to work on or near roofs or other places covered with fragile material, through which they are liable to fall, they should be provided with suitable roof ladders or crawling boards strong enough and when spanning across the supports for the roof covering to support those workers.
- A minimum of two boards should be provided so that it is not necessary for a person to stand on a fragile roof to move a board or a ladder, or for any other reason.

6.9 HANDLING AND LIFTING EQUIPMENT:

6.9.1 General Provisions

Following are the general guidelines to be followed with regard to all types of handling and lifting equipment in addition to the guidelines for specific type of equipments dealt later on.

- There should be a well-planned safety programme to ensure that all the lifting appliances and lifting gear are selected, installed, examined, tested, maintained, operated and dismantled with a view to preventing the occurrence of any accident;
- All lifting appliances shall be examined by competent persons at frequencies as per statute.
- Check thoroughly quality, size and condition of all lifting tools like chain pulley blocks, slings, U-clamps, D-shackles etc. before putting them in use.
- Safe lifting capacity of all lifting & handling equipment, tools and shackles should be got verified and certificates obtained from competent authorities before its use. The safe working load shall be marked on them.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
59 of 225

- Check periodically the oil, brakes, gears, horns and tyre pressure of all moving equipments like cranes, forklifts, trailers etc as per manufacturer's recommendations.
- Check the weights to be lifted and accordingly decide about the crane capacity, boom length and angle of erection.
- Allow lifting slings as short as possible and check packing at the friction points.
- While lifting/placing of the load, no unauthorised person shall remain within the radius of the boom and underneath the load.
- While loading, unloading and stacking of pipes, proper wedges shall be placed to prevent rolling down of the pipes.
- Control longer jobs being lifted up from both ends.
- Only trained operators and riggers should carry out the job. While the crane is moving or lifting the load, the trained rigger should be there for keeping a vigil against hitting any other object.
- During high wind conditions and nights, lifting of heavy equipments should be avoided. If unavoidable to do erection in night, operator and rigger should be fully trained for night signaling. Also proper illumination should be there.
- Allow crane to move on hard, firm and leveled ground.
- When crane is in idle condition for long periods or unattended, crane boom should either be lowered or locked as per manufacturer's guidelines.
- Hook and load being lifted shall remain in full visibility of crane operators, while lifting, to the extent possible.
- Don't allow booms or other parts of crane to come within 3 meters reach of overhead electrical cables.
- No structural alterations or repairs should be made to any part of a lifting appliance, which may affect the safety of the appliance without the permission and supervision of the competent person.

6.9.2 Hoists

- **Hoist shafts should be enclosed with rigid panels or other adequate fencing at:**
 - a) Ground level on all sides;
 - b) All other levels at all points at which access is provided;
 - c) All points at which persons are liable to be struck by any moving part.
- The enclosure of hoist shafts, except at approaches should extend where practicable at least 2mt above the floor, platform or other place to which access is provided except where a lesser height is sufficient to prevent any person falling down the hoistway and there is no risk of any person coming into contact with any moving part of the hoist, but in no case should the enclosure be less than 1mt in height.
- The guides of hoist platforms should offer sufficient resistance to bending and, in the case of jamming by a safety catch, to buckling.
- Where necessary to prevent danger, adequate covering should be provided above the top of hoist shafts to prevent material falling down them.
- Outdoor hoist towers should be erected on firm foundations, and securely braced, guyed and anchored.
- A ladderway should extend from the bottom to the top of outdoor hoist towers, if no other ladderway exists within easy reach.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
60 of 225**

- Hoisting engines should be of ample capacity to control the heaviest load that they will have to move.
- Hoists should be provided with devices that stop the hoisting engine as soon as the platform reaches its highest stopping place.
- Winches should be so constructed that the brake is applied when the control handle is not held in the operating position.
- It should not be possible to set in motion from the platform a hoist, which is not designed for the conveyance of persons.
- Winches should not be fitted with pawl and ratchet gears on which the pawl must be disengaged before the platform is lowered.
- Hoist platforms should be capable of supporting the maximum load that they will have to carry with a safety factor.
- Hoist platforms should be equipped with safety gear that will hold the platform with the maximum load if the hoisting rope breaks.
- If workers have to enter the cage or go on the platform at landings there should be a locking arrangement preventing the cage or platform from moving while any worker is in or on it.
- On sides not used for loading and unloading, hoist platforms should be provided with toe-boards and enclosures of wire mesh or other suitable material to prevent the fall of parts of loads.
- Where necessary to prevent danger from falling objects, hoist platforms should be provided with adequate covering.
- Counterweights consisting of an assemblage of several parts should be made of specially constructed parts rigidly connected together.
- Counterweights should run in guides.
- Platforms should be provided at all landings used by workers.
- Following notices should be posted up conspicuously and in very legible characters:
- On all hoists:
 - a) On the platform: the carrying capacity in kilograms or other appropriate standard unit of weight;
 - b) On the hoisting engine: the lifting capacity in kilograms or other appropriate standard unit of weight;
- On hoists authorized or certified for the conveyance of persons:
- On the platform or cage: the maximum number of persons to be carried at one time;
- On every approach to the hoist and on the platform: prohibition of use by persons.
- Hoists intended for the carriage of persons should be provided with a cage so constructed as to prevent any person from falling out or being trapped between the cage and any fixed part of the structure when the cage gate is shut, or from being struck by the counterbalance weight or by articles or materials tailing down the hoistway.
- On each side in which access is provided, the cage should have a gate fitted with devices which ensure that the gate cannot be opened except when the cage is at a landing and that the gate must be closed before the cage can move away from the landing.
- Every gate in the enclosure of the hoist shaft which gives access from a landing place to the cage should be fitted with devices to ensure that the gate cannot be opened except when the cage is at that landing place, and that the cage cannot be moved away from that landing place until the gate is closed.

6.9.3 Lifting ropes

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
61 of 225**

- Only ropes with a known safe working capacity should be used as lifting ropes.
- Lifting ropes should be installed, maintained and inspected in accordance with manufacturers' instructions.
- Repaired steel ropes should not be used on hoists.
- Where multiple independent ropes are used, for the purpose of stability, to lift a work platform, each rope should be capable of carrying the load independently.

6.10 VEHICLE MOVEMENT

- 6.10.1 Park vehicles only at designated places. Don't block roads to create hindrance for other vehicles.
- 6.10.2 Don't overload the vehicle.
- 6.10.3 Obey speed limits and traffic rules.
- 6.10.4 Always expect the unexpected and be a defensive driver.
- 6.10.5 Drive carefully during adverse weather and road conditions.
- 6.10.6 Read the road ahead and ride to the left.
- 6.10.7 Be extra cautious at nights. Keep wind screens clean and lights in working condition.
- 6.10.8 All vehicles used for carrying workers and construction materials must undergo predictive/preventive maintenance and daily checks.
- 6.10.9 Driver with proper valid driving license shall only be allowed to drive the vehicle.
- 6.10.10 Routes shall be leveled, marked and planned in such a way so as to avoid potential hazards such as overhead power lines and sloping ground etc.
- 6.10.11 While reversing the vehicles, help of another worker should be ensured at all times.
- 6.10.12 An unattended vehicle should have the engine switched off.
- 6.10.13 Wherever possible one-way system shall be followed.
- 6.10.14 Barriers/fixed stops should be provided for excavation/openings to prevent fall of vehicle.
- 6.10.15 Load should be properly secured.
- 6.10.16 The body of the tipper lorry should always be lowered before driving the vehicle off.
- 6.10.17 Signs/signals/caution boards etc. should be provided on routes.

6.11 ELECTRICAL

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
62 of 225

6.11.1 General Provisions

- Only persons having valid licenses should be allowed to work on electrical facilities.
- No person should be allowed to work on live circuit. The same, if unavoidable, special care and authorisation need to be taken.
- Treat all circuits as "LIVE" unless ensured otherwise.
- Electrical "Tag Out" procedure "MUST" be followed for carrying out maintenance jobs.
- Display voltage ratings prominently with "Danger" signs.
- Put caution/notice signs before starting the repair works.
- All electrical equipment operating above 250V shall have separate and distinct connections to earth grid.
- Proper grounding to be ensured for all switch boards and equipment including Portable ones prior to taking into service.
- Make sure that electrical switch boards, portable tools, equipments (like grinding machine etc.) don't get wet during their usage. If it happens, stop the main supply, make the tools dry and then only use them. Check proper earthing.
- All temporary switch boards/ KIOSKS put up at work site should be suitably protected from rain and the level of same should be high enough to avoid contact with water due to water logging.
- Don't work wet on electrical system.
- Don't overload the electrical system.
- Use only proper rated HRC fuses.
- Industrial type extension boards and Plug sockets are only to be used.
- ELCB for all temporary connections must be provided. Use insulated 3-pin plug tops.
- All power supply cables should be laid properly and neatly so that they don't cause hindrance to persons working and no physical damage also takes place to the cables during various construction activities.
- All Power cables to be properly terminated using glands and lugs of proper size and adequately crimped.
- Use spark-proof/flame proof type electrical fittings in Fire Hazard zones.
- Check installations of steel plates/pipes to protect underground cables at crossings.
- Don't lay unarmored cable directly on ground, wall, roof or trees. All temporary cables should be laid at least 750 mm below ground and cable markers should be provided. Proper sleeves should be provided at road crossings. In case temporary cables are to be laid on wooden poles/steel poles, the minimum cable heights should be 4.5 M.
- Maintain safe overhead distance of HT cables.
- Don't connect any earthing wire to the pipelines/structures.
- Don't make any unsafe temporary connections, naked joints/wiring etc.
- Ensure that temporary cables are free from cuts, damaged insulation, kinks or improper insulated joints.
- Check at periodic intervals that pins of sockets and joints are not loose.
- Protect electrical wires/equipments from water and naked flames.
- Illuminate suitably all the work areas.
- All switchboards should be of MS structure only and incoming source should be marked.
- Hand lamps should not be of more than 24V rating.
- Fire extinguishers (DCP/CO₂/Sand buckets) should be kept near temporary switch boards being used for construction purposes. Don't use water for fighting electrical fires.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
63 of 225

- Insulating mats shall be provided in the front and back end of switch boards.
- All parts of electrical installations should be so constructed, installed and maintained as to prevent danger of electric shock, fire and external explosion.
- Periodic checking/certification of electrical safety appliances such as gloves, insulating mats, hoods etc. to be done/witnessed along with maintaining a register at site signed by competent authority.
- A notice displaying following, should be kept exhibited at suitable places:
 - a) Prohibiting unauthorised persons from entering electrical equipment rooms or from handling or interfering with electrical apparatus;
 - b) Containing directions as to procedures in case of fire, rescue of persons in contact with live conductors and the restoration of persons suffering from electric shock;
 - c) Specifying the person to be notified in case of electrical accident or dangerous occurrence, and indicating how to communicate with him.
- No other cables/pipes to be laid in trench used for electrical cables.
- Utmost care should be taken while excavating Earth from cable trench to avoid damage or any accident.
- Sub-station floor cut-outs meant for switch board installations to be covered wherever installation is incomplete.

NOTE: A Residual Current Operated Circuit Breaker (RCCB) or Earth Leakage Circuit Breaker (ELCB), when installed, protects a human being to the widest extent. RCCB or ELCB should be provided as per Indian Electricity Rules.

6.11.2 Inspection and maintenance

- All electrical equipment should be inspected before taking into use to ensure suitability for its proposed use.
- At the beginning of every shift, the person using the electrical equipment should make a careful external examination of the equipment and conductors, especially the flexible cables.
- Apart from some exceptional cases, work on or near live parts of electrical equipment should be forbidden.
- Before any work is begun on conductors or equipment that do not have to remain live:
 - a) The current should be switched off by a responsible authorised person;
 - b) Precautions should be taken to prevent the current from being switched on again;
 - c) The conductors or the equipment should be tested to ascertain that they are dead;
 - d) The conductors and equipment should be earthed and short-circuited;
 - e) Neighboring live parts should be adequately protected against accidental contact.
- After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person after the earthing and short-circuiting have been removed and the workplace reported safe.
- Electricians should be provided with approved and tested tools, and personal protective equipment such as rubber gloves, mats etc.
- All conductors and equipment should be considered to be live unless there is a proof of the contrary.
- When work has to be done in dangerous proximity to live parts the current should be cut off. If for operational reasons this is not possible, the live parts should be fenced off or enclosed by qualified staff from the sub-station concerned.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
64 of 225

6.11.3 Testing

- Electrical installations should be inspected and tested and the results recorded.
- Periodic testing of the efficiency of the earth leakage protective devices should be carried out.
- Particular attention should be paid to the earthing of apparatus, the continuity of protective conductors, polarity and insulation resistance, protection against mechanical damage and condition of connections at points of entry.

6.12 DEMOLITION

6.12.1 General provisions

- When the demolition of any building or structure might present danger to workers or to the public:
 - a) Necessary precautions, methods and procedures should be adopted, including those for the disposal of waste or residues;
 - b) The work should be planned and undertaken only under the supervision of a competent person.
- Before demolition operations begin:
 - a) Structural details and builders' drawings should be obtained wherever possible;
 - b) Details of the previous use should be obtained to identify any possible contamination and hazards from chemicals, flammables, etc.;
 - c) An initial survey should be carried out to identify any structural problems and risks associated with flammable substances and substances hazardous to health. The survey should note the type of ground on which the structure is erected, the condition of the roof trusses, the type of framing used in framed structures and the load-bearing walls;
 - d) A method of demolition should be formulated after the survey and recorded in a method statement having taken all the various considerations into account and identifying the problems and their solutions;
- All electric, gas, water and steam service lines should be shut off and, as necessary, capped or otherwise controlled at or outside the construction site before work commences.
- If it is necessary to maintain any electric power, water or other services during demolition operations, they should be adequately protected against damage.
- As far as practicable, the danger zone round the building should be adequately fenced off and sign posted. To protect the public a fence 2m high should be erected enclosing the demolition operations and the access gates should be secured outside working hours.
- The fabric of buildings contaminated with substances hazardous to health should be decontaminated. Protective clothing and respiratory devices should be provided and worn.
- Where plant has contained flammable materials, special precautions should be taken to avoid fire and explosion.
- The plant to be demolished should be isolated from all other plant that may contain flammable materials. Any residual flammable material in the plant should be rendered safe by cleaning, purging or the application of an inert atmosphere as appropriate.
- Care should be taken not to demolish any parts, which would destroy the stability of other parts.
- Demolition activities should not be continued under adverse climatic conditions such as high winds, which could cause the collapse of already weakened structures.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
65 of 225**

- To prevent hazards parts of structures should be adequately shored, braced or otherwise supported.
- Structures should not be left in a condition in which they could be brought down by wind pressure or vibration.
- Where a deliberate controlled collapse technique is to be used, expert engineering advice should be obtained, and:
 - a) It should only be used where the whole structure is to come down because it relies on the removal of key structural members to effect a total collapse;
 - b) It should only be used on sites that are fairly level and where there is enough surrounding space for all operatives and equipment to be withdrawn to a safe distance.
- When equipment such as power shovels and bulldozers are used for demolition, due consideration should be given to the nature of the building or structure, its dimensions, as well as to the power of the equipment being used.
- If a swinging weight is used for demolition, a safety zone having a width of at least one-and-a-half times the height of the building or structure should be maintained around the points of impact.

6.12.2 Demolition of structural steelwork

- All precautions should be taken to prevent danger from any sudden twist, spring or collapse of steelwork, ironwork or reinforced concrete when it is cut or released.
- Steel construction should be demolished tier by tier.
- Structural steel parts should be lowered and not dropped from a height.

6.13 SAND/SHOT BLASTING/ SPRAY PAINTING

6.13.1 Sand blasting should be used only after approval from competent person.

6.13.2 Air Compressor used for sand/shot blasting/painting should have guard and positioned away from the work place.

6.13.3 Exhaust of the prime mover, if IC engine is used, should be directed away from the work place.

6.13.4 In case of motor driven compressor, the body of the motor as well as the compressor to be properly earthed.

6.13.5 The hoses used for compressed air should be of proper quality, and health of the same to be ensured through regular check/ test.

6.13.6 The operator of sand/shot blasting/painting should wear suitable PPE's including mask.

6.13.7 Adequate measures to be taken to suppress dust/spray particle.

6.13.8 Sand used for sand blasting should be suitably covered & protected from rain/moisture.

6.13.9 When these activities are done in confined places, adequate measure to be taken for proper ventilation.

7.0 ADDITIONAL SAFETY PRECAUTION FOR UNITS WITH HYDROCARBONS

**SIGNATURE OF TENDERER
SEAL**



In addition to general safety precautions as outlined above for the activities in Clause 6.0, following additional safety precautions need to be taken for the sites within the operating area or nearby, where presence of Hydrocarbons cannot be ruled out.

- **No job shall be carried out without a valid permit.**
- **Smoking should be prohibited in all places containing readily combustible or flammable materials and "No Smoking" notices be prominently displayed.**
- In confined spaces and other places where flammable gases, vapours or dusts can cause danger, following measures should be taken:
 - a) Only approved type electrical installations and equipment, including portable lamps, should be used;
 - b) There should be no naked flames or source of ignition;
 - c) **Oily rags, waste and clothes or other substances liable to spontaneous ignition should be removed without delay to a safe place;**
 - d) **Ventilation should be provided.**
- Regular inspections should be made of places where there are fire risks. These include the vicinity of heating appliances, electrical installations and conductors, stores of flammable and combustible materials, welding and cutting operations.
- Welding, flame cutting and other hot work should only be done after issuance of work permit in line with the requirement after appropriate precautions, as required, are taken to reduce the risk of fire.
- Fire-extinguishing equipment should be well maintained and inspected at suitable intervals by a competent person. Access to fire-extinguishing equipment such as hydrants, portable extinguishers and connections for hoses should be kept clear at all times.
- All supervisors and a sufficient number of workers should be trained in the use of fire-extinguishing equipment, so that adequate trained personnel are readily available during all working periods.
- Audio means to give warning in case of fire should be provided where this is necessary to prevent danger. Such warning should be clearly audible in all parts of the site where persons are liable to work. There should be an effective evacuation plan so that all persons are evacuated speedily without panic and accounted for and all plant and processes shut down.
- Notices should be posted at conspicuous places indicating:
 - The nearest fire alarm;
 - The telephone number and address of the nearest emergency services.
- The work site shall be cleared of all combustible materials, as Sparks and molten metal coming from the welding job can easily ignite combustible materials near or below the welding site. If the combustible materials cannot be removed from the area, the same shall be properly shielded.
- A dry chemical type fire extinguisher shall be made available in the work area. Also fire protection facilities like running hoses etc. as per permit should be complied with.
- Wherever required, welding screens shall be put up to protect other equipment in adjoining areas against flying sparks. Material used should be metal/asbestos/water curtain.
- Welding or cutting of vessels/ equipments used in Hydrocarbon/ hazardous chemicals shall be done after proper gas freeing and verifying the same with the explosive-meter.
- The confined space/equipment shall be gas freed and cleaned.
- Absence of any toxic gas and any flammable gas above explosion limit shall be ensured with the help of gas detection instrument and explosive meter respectively.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
67 of 225

- Used and hot electrode stubs shall be discarded in a metal bucket.
- Use approved and certified flame arrestors for vehicles.
- Work permit to be obtained, if construction work is carried out within existing operating area.

8.0 FIRST AID

First aid facilities should be provided in line with various statutory regulations like factory act etc. However following care should be taken:

- First aid, including the provision of trained personnel should be ensured at work sites. Arrangement should be made for ensuring the medical attention of the injured workers. First aid box should be as per the Factory rules.
- Suitable rescue equipment, like stretchers should be kept readily available at the construction site.
- First-aid kits or boxes, as appropriate and as per statutory requirements, should be provided at workplaces and be protected against contamination by dust, moisture etc.
- First-aid kit or boxes should not keep anything besides material for first aid in emergencies.
- First-aid kits and boxes should contain simple and clear instructions to be followed, be kept under the charge of a responsible person qualified to render the first aid and be regularly inspected and stocked.
- Where the work involves risk of drowning, asphyxiation or electric shock, first-aid personnel should be proficient in the use of resuscitation and other life saving techniques and in rescue procedures.
- Emergency telephone numbers of nearby Hospitals, Police, Fire Station and Administration should be prominently displayed.

9.0 DOCUMENTATION

The intention of keeping documentation of all types of accident(s) is to prevent recurrence of similar accident(s).

All accidents (major, minor or near miss) should be investigated, analysed and recommendations should be documented along with implementation status.

All related data should be well-documented and further analysis highlighting the major cause(s) of accidents be done. This will help in identifying thrust areas and training needs for prevention of accidents.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
68 of 225**

TECHNICAL SPECIFICATIONS

GENERAL SPECIFICATIONS

Unless otherwise specified in the Special Specifications, Bills of Quantities or Drawings the work shall conform to the following publications by the Institute for Construction Training And Development (ICTAD) – Sri Lanka of the Ministry of Housing, Construction and Public Utilities. (Formerly of the Ministry of Local Government, Housing and Construction)

1. Specification for Building Works – Sri Lanka (Volume I) – 1985 No. SCA/4 – Revision- Jul' 2004.
2. Specifications for Building Works – Sri Lanka (Volume II) – ICTAD Publication No. SCA/4/II Revised Edition – October 2001.
3. Specifications for Water supply, Sewerage & Storm water drainage works – Sri Lanka ICTAD Publication No. SCA/3/2, Revised Edition – April 2002
4. Specifications for Electrical & Mechanical works Associated with Building & Civil Engineering Sri Lanka – ICTAD Publication No. SCA/8 – 2nd Edition (Revised) August 2000.

As these are standard Specifications, it is likely that a number of specifications expressed will not apply to this project. The requirement of the above standard specifications applies only in respect of work shown in the Drawings and Bills of Quantities.

Special Specifications that follow shall be read in conjunction with the General Specification where applicable. Where the Special Specifications are in conflict with the General Specification, the Special Specifications shall prevail.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
69 of 225**

CIVIL SPECIFICATIONS

PARTICULAR SPECIFICATIONS

The particular specification (CIVIL) shall be read in conjunction with the General Specification where applicable. Where the particular specification is in conflict with the General Specification, the Particular Specification shall prevail.

All the British codes referred in the general specification shall conform to the latest relevant British standards.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
70 of 225

DETAILED ITEMWISE DESCRIPTION FOR CIVIL WORKS (WRT. ITEM CODE GIVEN IN THE PRICE
SCHEDULE)

1.0 PRILIMINARIES

- 1.1 Temporary disconnection and making temporary arrangements, for the supply of electricity, fuel lines, water, telephone and other services when required for the service station to function during construction of the facility , refurbishment of RO etc.

2.0 SITE CLEARANCE

- 2.1 Any obstacle in the site such as vegetation, grass, brush wood, trees and saplings including root shall be removed, including surface dressing and removal & disposal of earth and rubbish outside the periphery of the area or as directed by site engineer. Pits/hollows left due to removal of old foundation, uprooted trees etc shall be back filled with good soil and well compacted with a hand roller. The products to be handed over to LANKA IOC PLC shall be stacked in such a place and manner as instructed by site engineer and the same shall remain the property of LANKA IOC PLC. The unserviceable materials shall be disposed off at an unobjectionable location irrespective of any lead and lift at the risk of the contractor.

2.2 FELLING OF TREES

Felling of trees of girth measured at a height of 1 m above ground level including cutting of trunks and branches, removing the roots and disposal of all materials and filling and compacting of earth.

Item includes cutting and removing of trees of girth beyond 30cm measured at a height above 1m from ground level and disposal of all materials including serviceable and non-serviceable materials and removing the roots and back filling hollows with good soil with proper compaction.

2.2.1 Beyond 30 cm girth and upto 60 cm girth

- 2.2.3 Removing the roots by excavation of an already cut tree in the site upto a maximum girth 120cm and backfilling and compacting of the pit all complete as directed by Engineer-in-charge
Item includes removing the roots of already cut tree in the site up to a maximum girth of 120 cm and back filling the pit and well compacted in 20 cm layers. The wood, excess earth and other waste has to be removed from the periphery of the site. This rate quoted shall be applicable for removal of roots for each tree including already cut trees.

3.0 SOIL INVESTIGATION

- 3.1 Geological investigation works for the construction purposes of buildings, Canopy and underground tank installation at petrol sheds and other similar areas & comprising of Sinking bore hole in normal type of soil through shell and Auger method or any other method required as per site conditions in accordance with BS specifications. Each bore hole shall be of 50 is reachedia 150 mm and for a depth of 6 m or when N Value greater than (Minimum of 3 bore holes shall be considered for each site)

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
71 of 225**

3.1.1 Note: Rates shall include all field tests/ lab tests etc as per detailed specifications enclosed. Charges to be quoted shall be per bore hole only

3.1.2 Rate for additional depth of boring using rotary technique in soil beyond 6 M & up to 10 M if such instance is encountered at site. All other parameters are as per details mentioned above

3.1.3 Submission of detailed soil investigation report including Consultants recommendations for providing foundations for buildings/canopy/ Underground product tanks etc

4.0 DEMOLITION

All statutory requirements if any on safety of personal etc., shall be complied with.

All existing electrical, water and other service should be checked as to whether they are to be protected, altered, rerouted or removed.

All precautions against uncontrolled collapse of parts of building shall be avoided. Abutting structures shall be adequately taken care of during demolition.

Mechanical demolition by explosives and deliberate collapse shall not be allowed and obtain prior approval for the mode of demolition.

All demolished material shall be the property of the contractor and the same shall be lifted and transported from the site to anywhere outside the petrol station premises at contractors cost.

The dismantling item shall include all pumps, fuel storage tanks, air gauges, compressor, shall be stacked at the site as directed by the Engineer-in-charge.

Materials arising from the work shall not be used in the site except with the approval of the Employer.

4.1 Demolition Sales Building & RCC Canopy

4.2 Demolition Service Station with Hoist

4.3 Demolition Concrete Ramp

4.4 Demolition O/H Water Tank with structure

Demolish permanent / temporary following structures including foundations / Pavements & remove debris & materials from site for old CPC RO sites taken over by LIOC.

5.0 EARTHWORK EXCAVATION

EXCAVATION:

The existing driveway shown in the drawing are indicative and the levels at predetermined intervals shall be taken and shall be signed by the contractor and the engineer-in-charge. A reduced level should be recorded in conjunction with a benchmark available at the site or shall be constructed. All driveway cutting/filling shall be based upon these recorded levels.

The contractor shall provide all labour and instruments to obtain and record these levels, and the instrument should made available when ever is required.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
72 of 225**

The contractor shall visit the site irrespective and decide himself the nature of the ground, subsoil to be excavated and the ground water level. The furnishing of particulars of soil investigation/ bore log does not absolve the contractor from his responsibilities nor does it guarantee that similar conditions apply on the other parts of the site.

All excavated materials like stone etc., except findings like of antiquity, coins, fossils or other articles of value shall be property of the contractor and the same shall be lifted and transported from the site to anywhere outside the petrol station premises at contractor's cost.

Excavation shall be made to the correct profile and depth as directed by engineer-in-charge or as shown in the drawing as applicable.

The contractor shall provide, maintain and operate sufficient pumping equipment of the required capacity during the construction period and the sides of the excavation shall be timbered and shored at no extra cost.

The contractor should provide adequate caution and safety precaution around the excavated area.

5.1 EXCAVATION OF ALL KIND OF SOIL EXCEPT HARD ROCK

5.1.1 Up to 1.5 m

5.1.2 Above 1.5 up to 3.0 m

- i) Excavation for foundations, substructures, etc. to the specified depths below existing ground level, in all types of ordinary and hard soils excluding hard rock. Item includes de-watering, shoring, strutting, backfilling with selected excavated material, stacking earth for back filling and/or disposing excess excavated material outside the premises of LIOC at an unobjectionable place irrespective of lead etc as specified in detailed description (The rate shall include dewatering of the excavated area till completion of all works up to ground level)
- ii) Disposal of all surplus materials outside the premises of LIOC at an unobjectionable place or as directed by Site Engineer irrespective of leads. The excess excavated materials mean materials, which are not required for use at the site. For the excavated materials used at site, leveling watering, consolidation in layers of not more than 200 mm, dressing etc. has to be done free of cost, wherever required.
- iii) Disposal of excess excavated material to be done only after approval of LIOC engineer.
- iv) Back filling shall be done by proper watering to achieve compaction. All surplus materials shall be disposed off beyond municipal limits or as directed by Site Engineer, irrespective of lead. Along highways, the excavated earth shall be disposed off to an unobjectionable place without limitations in lead. The CONTRACTOR, if required shall obtain necessary approval from the concerned authorities.
- v) For excavation at any additional lift of 1.5m beyond the initial lift of 1.5 m / 1.5 m - 3 m, only the specified rates given in the respective sub items shall be applicable.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
73 of 225**

5.2 EXCAVATION IN HARD ROCK BY CHISLING / MECHANICAL EQUIPMENTS

5.2.1 Up to 1.5 m

5.2.2 Above 1.5 up to 3.0 m

Excavation for foundations, substructures, etc. to the specified depths below existing ground level, in hard rock by chiseling/pneumatic drilling. Item includes de-watering, shoring, strutting, disposing excess excavated material outside the premises of LIOC at an unobjectionable place irrespective of lead etc as specified in detailed description. (The rate shall include dewatering of the excavated area till completion of all works upto ground level)

The above items shall be executed as per:

- i) The excavated material like stone etc. shall be the property of the Contractor and the same shall be lifted and transported from the site to anywhere outside the RO / LIOC premises at contractor's cost.
- ii) The measurements shall be made in cubic Metre unless otherwise specified and as per the sizes and dimension mentioned in the drawing.

5.3 EXCAVATION IN HARD ROCK BY BLASTING

5.3.1 Up to 1.5 m

5.3.2 Above 1.5 up to 3.0 m

Excavation for foundations, substructures, etc. to the specified depths below existing ground level, in hard rock by controlled blasting. Item includes de-watering, shoring, strutting, disposing excess excavated material outside the premises of LIOC at an unobjectionable place irrespective of lead etc as specified in detailed description. Backfilling shall be paid separately. (The rate shall include dewatering of the excavated area till completion of all works up to ground level)

a. General

Item refers to excavation in hard rock & boulders by controlled blasting. The excavation shall be for building/ canopy foundations, tank pits, trenches, pipelines and any other foundations in hard rock in wet or dry condition.

b. Guidelines for blasting:

i) Drilling Holes

Drilling may be done by percussion drilling or any other method duly approved by the site engineer. The drilling patterns & depth of drilling shall be worked out by the contractor and got approved by LIOC site engineer before commencement of work. Rate includes cost of drilling equipments, materials, labour etc.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
74 of 225**

ii) Blasting General

Work shall be carried out in line with LIOC specifications. Contractor shall obtain license from competent authority or carrying out blasting work. Contractor shall also obtain license for procurement & storing of explosives as per Explosives Act amended up to date and explosive rules. All rules, regulations & laws as per explosives rules amended up to date in respect of procurement, transportation, storing, handling & precautions during blasting of explosives shall be rigidly followed. The storage magazines shall be designed & built according to specifications of explosives department and located at the approved site. It should have lightening conductor & inflammable material should not be allowed near magazine building. The magazine shall be well protected by proper fencing, guarded & locked properly. Only authorized personnel shall be allowed to enter the magazine. All the necessary notices & instructions shall be displayed in premises of magazine and strictly followed. Blasting shall be commenced only after obtaining written permission from LIOC site engineer.

iii) Blasting Materials.

The contractor shall purchase blasting materials only from licensed dealer.

Fuses: All fuses shall be of required length & jointing shall be avoided as far as possible. If jointing is necessary, a semicircular niche shall be cut in one piece and the other piece shall be inserted in this niche & the two pieces shall be wrapped together. All joints exposed to dampness shall be wrapped with rubber tape. The fuses & detonators shall be stored away from explosives.

Gun Powder: The normal blasting shall always be done with gun powder. Gun powder may be in the form of pellet blasting cartridges or as powder of granules.

Blasting Operators: Contractor shall employ experienced & well trained supervisor & other assisting labour. The supervisor shall hold license for blasting operation.

c. Procedure for blasting

Blasting With Gun-powder

The drilled holes shall be thoroughly cleaned and inspected by the LIOC site engineer. The gunpowder cartridges are provided with tapered central holes. The fuse is inserted through the narrow end and is double backed, so that when the fuse is pulled it is held tight in the tapered hole. The required numbers of other cartridges as per the designed charges are then inserted through fuse. The cartridges along with the fuse are then inserted in the drilled hole, placed to required position by pressing gently with dry hay or turf. The rest of the drilled hole is filled with dry clay and tamped with copper or brass rod till it becomes compact. The safety fuses shall be taken to sufficient distances away so as to allow the blasting to take place after the Contractors person/s lighting the fuses withdraw to the safe distance. At a time not more than 10 charges shall be blasted. When the gunpowder in the form of powder or granules is used, it shall be introduced in the drilled hole by means of funnel or copper tube. The drilled holes shall be filled with two thirds of charge required. The fuse wire shall be directly placed above the powder and the

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
75 of 225**

balance one-third depth of charge shall then be gently filled and pressed home with dry hay or turf. The rest of the hole shall be filled with dry clay. The charges shall be fired by lighting the fuse.

Controlled Blasting

Controlled blasting is required to protect the buildings, installations and habitations surrounding the blasting zone. The vibrations caused during the blasting operation are required to be controlled. The drilling pattern and the charge in each hole shall be properly designed and the contractor shall get approved first the design and system of drilling and blasting operation. Along with the precaution of low charges following additional precaution to prevent flying of rock pieces shall be taken. The area to be blasted shall be covered with the MS plates of not less than 12 mm thick. Reinforcement mesh of minimum 20 mm dia bars placed at 150 mm c/c in both directions shall be placed over the steel plates. Sand filled bags in 6 to 8 layers shall be placed above the reinforced plates. The thickness of plate and the dead weight of sand bags to be covered over the blasting area shall be got approved from the LIOC Engineer. The steel plates and the reinforcement shall be inspected and any twist shall be removed after every blast, before they are reused.

Misfires

The number of charges loaded and the actual number of shots heard shall be same. If the number of actual shots heard is less, after sufficient laps of time to allow for late firing, the charge/s which has missed shall be inspected and marked in red oil paint. In case of gun-powder, these charges shall be flooded with water and new hole shall be drilled at about 45 cm away and blasted with normal procedure. The misfired charge shall also get blasted at the same time. If not continue water flooding of this hole and drilling of another hole at 45 cm apart and blasting it.

Responsibility

The contractor is solely responsible for any accident during transportation, storage and blasting operation. He shall pay the compensation to the injured or dead personnel and damages to the property etc. without extra claims from IOC. Further, the contractor is also liable to be penalized for safety lapses as specified in the contract. The contractor shall maintain the proper accounts of the explosives in the registers and shall be open for inspections to the Engineer-in-charge or the authorized officers from the Explosive department.

d. Foundation Preparation

The foundation shall be cleared of all loose material and shall be dressed by chiseling to the correct line and level. The contractor shall not excavate below the line shown in the drawing or as directed. No foundation of any sort shall be laid unless the Engineer-in-charge approves/passes the depth of excavation to lay foundation and record the dimensions and elevations and types soils of the foundation pit, trench excavated.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
76 of 225**

e. Shoring & strutting

The rate includes cost of shoring and strutting and the same shall not be paid separately. The type and designing of shoring shall be decided by the contractor, and shall get approved from IOC Engineer.

f. Disposal of excavated material

The boulders obtained during the excavation shall be broken into the rubble of size of about 225 mm. This rubble shall be stacked in measurable hips and at locations, as directed, within the initial lead of 50 m from the edges of excavation as directed for measurement. Item also includes disposal of excavated rock to an unobjectionable place including all lead & lift complete.

g. Dewatering

It is the responsibility of the contractor to remove the water accumulated in the pit or trench, from sub-soil water or from rains or from any other natural source, by manually or by pumping out as required. No extra payment shall be made for bailing out the water. The contractor may be required to provide temporary bunds, or provide bypass arrangements to avoid entering of water in the excavation at his own cost. The drained water shall be properly disposed off, so as not to cause any damages to the excavated area nor to the surrounding structures. The contractor shall keep the excavated area dry for measurements and for laying of foundation mortar or concrete or till completion of all works up to formed ground level.

h. Backfilling

Backfilling of excavated pits shall be done with clean non corrosive material such as clean washed sand or gravel. Watering and consolidation should be as per IOC specification No. 1. In case of tank pits, Back filling below, around and above tanks should be of clean, non-corrosive material such as clean washed sand or gravel. Watering and consolidation should be as per IOC SPECIFICATION NO. 2.

i. Protective measures

As all the excavated pits, trenches etc. shall be properly barricaded to avoid any accidents, red flags shall be prominently displayed around the area to be blasted. It is the responsibility of the contractor to take the adequate protective measures and safety of the excavation, people and workmen and surrounding properties and will have to bear the damages if caused. All the cost of protective measures shall be included in the item rate. Additional protective measures may have to be provided as directed by IOC engineer for which, no extra payment will be made.

j. Mode of measurement

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
77 of 225**

The excavated rock (by blasting) shall be stacked neatly indicated above. The stack measurements shall be taken jointly and payment shall be made for the quantity after deducting 40 % of voids. The size of stacks shall be 3.0 m X 2.0 m X 1.0 m size preferably.

5.4 MASS MECHANICAL EXCAVATION

5.4.1 Mass mechanical excavation of Land

Mass mechanical excavation of Land, excavated earth in all kinds of soils excluding hard rock. Item includes dewatering, leveling of surface, filling at site if necessary, stacking serviceable material, disposing the surplus excavated materials within / outside LIOC premises to an unobjectionable location irrespective of any lead & lift, as directed by LIOC. The excavation shall be termed as mass excavation if and only if the quantity of excavation is minimum 100.00 CUM. (Measurement will be only for the quantity of cutting)

- i) Mass Mechanical excavation of land, earth comprising of all kinds of soft and loose soil, gravel, soft rock, shrubs and grass. The excavation shall be termed as mass excavation if and only if the quantity of excavation is minimum 100.00 cum including all lead and lift after approval from the LIOC engineer.
- ii) In case of mass excavation, the contractor shall intimate the LIOC engineer with relevant drawings such as existing ground levels and the proposed levels to which the excavation shall be done.
- iii) After completion of Mass mechanical Excavation, the final levels shall be taken and submitted. The Quantity calculation shall be made using 'SIMPSONS RULE' only.
- iv) The scope of work includes
 - a. Removal of tree roots of already cut trees if any (tree cutting shall be paid separately under item rate) and no additional payment shall be made for the same.
 - b. Surface dressing of the ground including removing vegetation, undulations not exceeding 15cm in depth & disposal of rubbish, soft & hard pebbles to an unobjectionable area, irrespective of lead & lift including surface rolling with hand roller.
 - c. Item also includes clearing of jungle including uprooting of vegetation, grass, bush wood & saplings of girth up to 30cm, measured at a height of 1 m above the ground level and disposal of rubbish to an unobjectionable area irrespective of lead & lift.
- v) Excavation in hard rock shall be paid separately.
- vi) Backfilling shall be done by proper watering to achieve compaction. For the excavated materials used at site, leveling watering, consolidation in layers of not more than 200 mm, dressing etc. has to be done free of cost, wherever required.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
78 of 225**

- vii) Disposal of all surplus materials beyond municipal limits or as directed by site engineer irrespective of leads. Along highways excavated earth shall be disposed at an unobjectionable place without limitations in lead. The contractor, if required shall obtain necessary approvals from the concerned authority.
- viii) The excavated material like stone etc. shall be the property of the Contractor and the same shall be lifted and transported from the site to anywhere outside the RO / LIOC premises (irrespective of lead) at contractor's cost.
- ix) The measurements shall be made in cubic meter. Quantity payable shall be strictly as per the sizes and dimension mentioned in the drawing or site measurements whichever is less.

6.0 PROV. & INJECTING ANTI TERMITE EMULSION

6.1 Injecting chemical emulsion for anti- termite treatment (ZICL060100)

Providing and injecting chemical emulsion for pre-constructional anti- termite treatment and creating a chemical barrier as per IS 6313 (Part II) for walls, trenches, foundation, top surface of plinth filling, foundation of walls, floor, along exterior perimeter of building etc. complete, conforming to manufacturers specifications & as directed by LIOC using Chloropyriphos Emulsifiable 20 % concentration (The actual plinth area shall be measured for payment).

- i) The work shall be executed for walls, trenches, foundation, top surface of plinth filling, foundation of walls, columns, floor along exterior perimeter of building, expansion joints, surrounding of pipes & conduits, etc.
- ii) The work shall be executed with 10 years service guarantee for the pre treatment with CHLOROPIRYPHOS 20% EC.
- iii) Plinth area of the building at G.F shall be the basis for measurement.

7.0 SUPPLY, FILLING & COMPACTION

Refilling and Banking:

The earth shall be free from all vegetation and all lumps and clods exceeding 80mm in any direction shall be broken. The earth shall be consolidated well watered in layer not exceeding 200mm.

Supply, filling, spreading and compacting after sprinkling required quantity of water using 8 to 10 ton roller to 95% of maximum dry density in layers not exceeding 200 mm compacted thickness as per the detailed specifications.

7.1.1 Imported approved quality gravel.

- i) Imported approved quality Gravel shall be obtained from quarry of red gravel with grading requirement as per the SL guidelines, of CBR value not less than 20% or any other quality specified & shall be free from earth & other foreign matters etc. The CONTRACTOR shall obtain approval for the gravel proposed to be used for filling from the Site In charge /Engineer before carrying out the work.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
79 of 225**

- ii) Filling shall be done in regular horizontal layers of not more than 200mm compacted, including dressing, watering, compacting with steel/ wooden rammer, consolidating with 8-10 tone road roller for a compaction of field dry density 98% of maximum laboratory dry density. The minimum number of passes of the roller required over each layer shall be ensured as per instruction of LIOC Engineer/Consultant. Field density tests shall be conducted for every layer after rolling and the minimum compaction to be achieved shall be 95% of Lab Modified Proctor Density failing which further watering, rolling shall be carried out until the desired compaction is achieved. The final surface shall be trimmed and leveled to proper profile as required. The rate includes cost of imported gravel, transportation to site irrespective of lead and lift, leveling, watering and rolling, testing etc. complete.

7.1.2 Selected imported earth

- i) Earth shall be free from roots, grass, rubbish, debris, waste materials & all foreign matters. The CONTRACTOR shall obtain approval for the earth proposed to be used for filling from the Site In charge /Engineer before carrying out the work.
- ii) Filling shall be done in regular horizontal layers of not more than 200mm compacted including dressing, watering, compacting with steel / wooden rammer, consolidating with 8-10 tone road roller for a compaction of field dry density 95% of maximum laboratory dry density as per IS 2720 (part vii). Field density tests shall be conducted for every layer after rolling and the minimum compaction to be achieved shall be 95% failing which further watering, rolling shall be carried out until the desired compaction is achieved. Compaction test shall be taken after completing the filling and consolidation by the Contractor for assessing the CBR value. The rate includes cost of imported earth, transportation to site irrespective of lead and lift, leveling, watering and rolling, testing etc. complete.

7.1.3 Clean coarse river sand

7.2 FILLING IN PLINTH

Filling in plinth or where directed including supply, transporting and spreading, thoroughly compacted in layers not exceeding 200 mm in depth complete. Item shall also be applicable for filling in trenches.

7.2.1 With selected excavated earth.

7.2.2 With selected imported earth.

- i) Earth shall be free from roots, grass, rubbish, debris, waste materials & all foreign matters.
- ii) Filling shall be done in regular horizontal layers of not more than 200mm compacted including dressing, watering, compacting with steel / wooden rammer, consolidating with hand roller / hand rammer / flat vibrator, leveling etc complete in all respects as per the direction of site engineer.

8.0 PIPE LINE/CABLE TRENCHES (Without Brick work)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
80 of 225**

Providing trenches (without brick works) as per drg No LIOC/ENG/STD/01, excavations and filling, 100mm thick concrete layer (CC 1:2:4), removal of debris from the site, etc, complete. (Driveway cutting with breaking of concrete will be paid separately).

8.1 Pipe line trenches (450mm deep & 300mm wide).

8.2 Cable line trenches (300mm deep & 300mm wide).

9.0 CONCRETING

The grades of the concrete shall be as indicated in the drawing and specification. In general unless otherwise specified shall be of volume batched mix satisfying

1. The proportion of the constituents by volume
2. Nominal maximum size of the aggregate
3. Grade of concrete

Testing and acceptance shall be as per relevant BS code.

Where the contractor is intends to use ready mix concrete all the relevant particulars detailed in BS 5328 shall be furnished for the approval of the engineer-in-charge..

Aggregates coarse and fine shall be from natural sources complying with the requirement of BS 882. The fine aggregate shall be natural sand.

Before commencing any run of concreting, adequate quantity of aggregate is stored at the site complying with the BS code requirement.

The suitability of aggregates relevant to particular concrete shall be established well in advance by obtaining sample from sources and determining the following properties.

- a) Clay silt and fine dust.
- b) Grading Limits.

The grading when determined by a test according to BS 882, shall be within the limits prescribed.

Additives, plastisizer or other workability agent shall not be used without the written approval of the engineer in charge.

Machine mixing only shall be allowed in addition to ready mixed concrete. Measuring box of size 400 x 350 x 250mm shall be used for measuring the fine and coarse aggregate. All concrete should be adequately compacted by means of vibrators.

Casting and the curing of concrete shall be planned and executed in such a way that the concreting during hardening is protected against harmful influence from the environment and from that of hydration. Curing has to be done for a minimum period of 14 days and may be prolonged as required by the Engineer in charge.

Rate of sampling for strength testing:

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
81 of 225**

Foundations and columns: 1 sample for each 10m³ of 10 batches
Whichever represents the lesser volume.
Beams, slabs, walls, stairs: 1 sample for each 20m³ or 20 batches
Whichever represents the lesser volume.
At least one sample should be taken of each grade of concrete on each day that concrete is placed.

From each sample 6 test cubes shall be made, using standard cast-steel moulds.

2 cubes shall be tested for compressive strength at 7 days and 4 cubes at 28 days. Sampling, casting, curing and testing shall comply with BS 1881.

Testing shall be done in an approved laboratory.
Compliance with specification will be checked as per BS 5328: Par 4 : 1990.

All pre cast concrete shall be inclusive of formwork, casting with all necessary labour and material, loading, transporting to site, unloading, handling, stacking and laying in position. Reinforcement shall be paid separately.

In case of Ready Mix Concrete trial mixes shall be prepared for grade of concrete in accordance with BS 1881 unless there are existing data showing that the proposed mix proportions and manufacture will produce a concrete of the strength and quality required having adequate workability for compaction by the method to be used in placing. The Contractor shall, before the commencement of the concreting, have preliminary trial mixes prepared, preferably under full scale production conditions or if this is not possible, in an approved laboratory using a sufficient number of samples to be representative of the aggregates and cement to be used. Where a trial mix is required after commencement of the work, the above procedure shall be adopted for full-scale production conditions as approved.

The workability of each batch of the trial mixes shall be determined by the slump test as described in BS 1881 or by an alternative approved method. When a mix has been approved, no variation shall be made in the proportions, the original source of cement and aggregates or their type, size on grading zone without the consent of the Engineer.

9.1 PROVIDING & LAYING PCC USING MACHINE MIX CONCRETE (MMC)

Providing and laying of plain cement concrete (PCC) of specified grade conforming to latest BS standards for all works in foundation, plinth & superstructure. Item includes cost of all materials, mixing, pouring in position, compaction, curing, finishing etc complete as specified in detailed description.

- i) Concrete shall be mixed in mechanical batch type concrete mixers.
- ii) Providing and laying Cement Concrete in foundations plinths and superstructure including following items of works with all leads and lifts as per BS specification.
- ii) Providing and laying of plain cement concrete (PCC) conforming to latest BS standards with hard stone aggregate of specified size. Item includes curing of concrete with a layer of soaked canvas, hessian or similar absorbent materials and kept constantly wet for the

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
82 of 225**

required period and finishing the exposed surfaces. PCC to be laid in foundations, floorings, mass concrete, window-sills, beam bed blocks, etc. complete, excluding shuttering, as per specifications, drawings or as directed by LIOC. (Form work shall be paid separately)

9.1.1 Plain Cement Concrete 1:3:6 using 40mm nominal size aggregates

9.1.2 Plain Cement Concrete 1:2:4 using 20mm nominal size aggregates

9.2 PROVIDING & LAYING RCC USING MACHINE MIX CONCRETE (MMC)

Providing and laying of reinforced cement concrete (RCC) of specified grade conforming to latest BS Standards Item includes cost of all materials including mixing, pouring in position, compaction, scaffolding, curing, finishing etc but excluding steel reinforcement complete.

- i) The concrete work in superstructure / foundation also includes cost of centering. (Formwork & reinforcement shall be paid separately)
- ii) Concrete shall be mixed in mechanical batch type concrete mixers.
- iii) Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the formwork with the help of mechanical vibrators. MANUAL COMPACTION SHALL NOT BE PERMITTED.
- iv) The cement as specified in the item shall be used for RCC work in specified ratio.
- v) The cement used shall be Ordinary Portland Cement 43 grade.

9.2.1 Concrete of nominal mix 1:1.5:3 in foundations plinth, beams, columns, pedestals, walls, pile caps etc – up to plinth level.

9.2.2 Concrete of nominal mix 1:1.5:3 In lintels, shelves, balconies, beams, sunshades, wall, column, roof slab, staircase, fins, fascia etc- above plinth level.

9.3 PROVIDING AND LAYING RCC USING RMC

Providing and laying of reinforced cement concrete (RCC) of specified grade conforming to latest BS Standards using RMC. Item includes cost of all materials excluding steel reinforcement, mixing, pumping / pouring in position, compaction, scaffolding, curing, finishing etc complete as specified in detailed description.

- i) The concrete work in superstructure/foundation also includes cost of centering. (Form work & reinforcement shall be paid separately)
- ii) Concrete shall be mixed in mechanical batch type concrete mixers.
- iii) Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the formwork with the help of mechanical vibrators. MANUAL COMPACTION SHALL NOT BE PERMITTED.
- iv) The cement as specified in the item shall be used for RCC work in specified ratio.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
83 of 225**

- v) RMC shall be of specified grade as per item specifications. The source of supply shall be got approved by the engineer prior to concreting work. The admixtures as per BS specifications only shall be used in the mix. The strength of concrete has to be confirmed by testing samples of cubes taken at site for acceptance of the structure.

9.3.1 RMC of mix M 20 from approved source in foundations plinth, beams, columns, pedestals, walls, pile caps etc – up to plinth level (ZICL090301).

9.3.2 RMC of mix M 20 from approved source in lintels, shelves, balconies, beams, sunshades, wall, column, roof slab, staircase, fins, and fascia etc- above plinth level (ZICL090302).

9.4 RCC LINTELS

RCC Lintels (1:1 1/2: 3 in machine mix), rate to include form work & reinforcement as per drawing No LIOC/ENG/STD/02.

9.4.1 115 x 150 concrete lintel.

9.4.2 225x 150 concrete lintel.

10.0 FORM WORK

Shall include all temporary forms/moulds required for casting the concrete-in-situ and all the temporary construction required for support.

Suitable camber shall be provided to counteract the effect of deflection for horizontal members and shall be generally be 0.1% and 0.2% for beams and slabs

Formwork shall be of quality timber, plywood or steel. Rubber wood shall not be used.

Sufficient precaution has to be taken. And while concreting in progress, at least one carpenter/fitter shall be readily available. The contractor shall give the engineer in charge due notice before placing any concrete in the forms to prevent him to inspect and accept the formwork as to its strength, alignment and general fitness. However such inspection shall not reveal the contractor of his responsibility for safety.

Necessary precaution is to be taken against any leakage of cement slurry during concreting like providing tape for the shuttering joints in the case of roof slab.

Time of removal shall be as per Specification For Building Works - Sri Lanka (Vol. I) Table 5.2 in general but the officer-in-charge may however extend the periods.

Approved type form work as per the specifications for foundation, Columns, Beams & slabs etc including de-shuttering.

Shuttering for slabs and projections shall be done with steel plates & steel jacks/ props only. Waterproofing paper or other suitable material shall be provided whenever directed by site engineer. However in exceptional circumstances, after obtaining approval from site engineer, the contractor may provide shuttering using 25mm thick country wooden planks duly supported on wooden beams for slabs and projections.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
84 of 225

10.1 Form work.

11.0 STEEL REINFORCEMENT

Steel reinforcement shall comply with specifications in BS 4449-1988 and mesh reinforcement with BS 4483 – 1985.

Where high-yield steel is specified, Lanka Tor steel as manufactured by Sri Lanka Steel Corporation or other steel conforming to specifications may be used. The Contractor shall submit a certificate of origin and compliance with the requirement of related Sri Lanka and/or British standards to the satisfaction of the Engineer in charge. Such certification shall be obtained from an Independent laboratory at the contractor's own cost.

The laps shall be staggered and located at points along the span where neither shear nor bending moment is a maximum. The lap length and anchorage length shall be as per relevant BS code. Lapping bars shall be bond together at intervals not exceeding twice the diameter of such bars with two strands of annealed steel wire of 1.6mm thickness twisted tight.

Rolling margin and any manufacture defects shall be removed. The rates shall be inclusive of laps, tying wire, spacer block/bars, chairs, hangers, other than designed laps.

Concrete cover to reinforcement

Minimum clear cover to steel reinforcement bars should be provided according to the General Notes Drawing if available or as indicated below if a General Notes Drawing is not available: The requirements of the General Notes Drawing will take precedence over the requirements given below.

Foundations and plinth beams	-40mm
Slabs	-20mm
Beams	-25mm to stirrup bars
Columns	-40mm to bar links
Water sumps, Tanks and Drains	-40mm
Earth retaining walls	-40mm
Ground floor slabs	-50mm from top surface
Spacers for achieving Cover Reinforcement	

Specified concrete cover to reinforcement bars should be provided using cover blocks made with the same specified grade of concrete using smaller size of aggregate. Chairs should be used to support top horizontal reinforcement and to separate vertical reinforcement in walls.

Providing, bending, laying, binding & fixing in position TMT bars / High Yield Strength deformed bars conforming to BS 8110 of approved make, including supplying & providing soft annealed wire used for binding at all levels and locations for RCC work with all leads & lifts.

- i) Supplying and fixing in position High-yield strength deformed reinforcement bars conforming to BS 8110 for RCC works.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
85 of 225**

- ii) The item includes supplying & bending, lapping and /or welding wherever required, (as per drawing) laying in position of all sizes of MS/TOR steel using binding wire including all leads & lifts.
- iii) The item includes Dowel bars also, which shall be paid separately. (Laps, wastages & chairs shall not be measured & paid separately)

11.1 Reinforcement 6 mm - 32mm dia. Bar and links.

12.0 STONE MASONRY

Stones used shall be hard, sound and be obtained from approved quarry and each stone shall be such that dimension in any direction shall not be less than 150mm nor greater than 300mm except bond and quoin stone.

Bond stone shall be built into the wall at interval of 1800 mm and shall be marked suitably on the face as directed by engineer in charge.

Refilling of excavation shall be allowed only 24 hours of construction and curing shall be done for a minimum period of seven days.

12.1 RANDOM RUBBLE MASONRY IN CM1:6

Providing Random Rubble Masonry in CM 1:6 with hard stone below and above plinth at all levels including scaffolding, dressing of stones, packing interstices, leveling, curing etc. complete

- i) Random Rubble Masonry in CM 1:6
- ii) Providing Random Rubble masonry (maximum size of the stone to be 250 x 250 x 250 except for bond stone) in Cement Mortar 1:6 (1Cement: 6 coarse sand) in foundation, plinth, superstructure etc. including all leads and lifts. Bond stones shall be given at every 1.5 M spacing in every course. Key stones in between the courses shall be provided at spacing not more than 2.0 M.

12.1.1 Random Rubble masonry in foundation & superstructure.

12.2 SIZE STONE MASONRY IN CM 1:6

Providing size stone masonry (first sort) in CM 1:6 with hard stone, in foundation, plinth and superstructure including scaffolding and all lead and lift.

- i) Providing coursed rubble masonry (first sort) (maximum size of the stone to be 250 x 250 x 250 except for bond stone) in Cement Mortar 1:6 (1 Cement: 6 coarse sand) in foundation, plinth, superstructure etc. all lead and lifts.

**SIGNATURE OF TENDERER
SEAL**



- iii) Bond stones shall be given at every 1.5 M spacing in every course. Key stones in between the courses shall be provided at spacing not more than 2.0 M.

12.2.1 SS masonry in super structure.

12.3 STONE PITCHING 225MM THICK

Providing dry stone pitching 225 mm thick laid in courses and required profile with hammer dressed stones having no side less than 150 mm, with minimum depth 200 mm including preparing bedding surface, pointing with CM 1:3 mix, all lead and lifts, etc. complete.

Providing stone pitching over earth filling in sloped and leveled surfaces including necessary pointing with CM 1:3 mix. The size of stone to be used for pitching shall not be less than 225mm thick in any two faces.

12.3.1 Stone Pitching 225 mm thick laid in course.

13.0 BRICK MASONRY

Clay bricks used shall be of common burnt clay brick of Type II – Grade I of average compressive strength not less than 4.8 N/mm².

The nominal dimension of individual bricks shall be 220mmx105mm x 65mm. and the bricks before their actual usage shall be tested for the compliance as per SLS 39.

The mortars designation for brickwork shall be cement – sand mix 1:5 unless otherwise specified and the thickness of the mortar joint shall not be exceeded 10mm.

The brickwork shall be laid in English bond with frogs up and half or cut bricks shall not be used w\except where necessary to complete the bond. The brickwork shall not be built higher than 1.5 m in a single day.

All plastered face shall be raked to a minimum depth of 12mm when the mortar is still green and all un plastered surface shall be struck flush.

All half brickwork shall be reinforced with two numbers of 6mm dia bars at every 4th layer. They shall be placed over cement mortar 10mm thick bed of mix 1:5 and covered with a bed of 10mm mortar immediately.

The curing shall be done for a minimum period of seven days.

Brickwork with locally available good quality brick masonry with bricks having minimum crushing strength of 50 kg/cm² including scaffolding, curing, etc. for walls, parapets, etc. below and above plinth at all levels, joints/wall surface prepared either for pointing or plastering complete, as per the specifications, drawings or as directed by LIOC.

- i) Providing good quality brick masonry with bricks of class designation 50 in foundation / superstructure, in CM 1:5 including all leads and lifts.
- ii) Providing half brick masonry (115 mm thick) class designation 50 /75 in superstructure, in CM 1:5 including all leads and lifts with 2 Nos. 6 mm dia round MS bars laid longitudinally after every fourth course.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
87 of 225**

13.1 Brick work 115mm thick in all floors in cement mortar 1:4 with hoop iron comprising of 2 Nos. 6mm dia. round bars after every fourth course.

13.2 Brick work 225mm thick in Ground floor & up to 3rd floor levels in cement mortar 1:5.

13.3 Brick work 340mm thick in Tank pits in cement mortar 1:5 in Tank pits /superstructure.

14.0 DAMP PROOF COURSE

Damp proof course shall be provided for 40mm thick with cement concrete mix 1:2:4 (10 mm) (one part cement two part fine aggregate sand and 4 part coarse aggregate with graded stone aggregate of 10mm and down).

Curing has to be done for a minimum period of 7 days and may be prolonged as required by the Engineer in charge.

The down aggregate shall be mixed with 2% of cement by weight integral approved water proofing compound

The finish shall be semi-rough finish including all labour and material complete as per Specification For Building Works - Sri Lank Vol. I).

14.1 (DPC-DAMP FROOF COURSE) PROVIDING & LAYING 50MM PCC 1:2:4 SCREED

Providing & laying 40 mm thick damp proof coarse in plain cement concrete mix 1:2:4 using 20mm downgraded coarse aggregate including providing and mixing water proofing material 'Impermo' or equivalent @ 1Kg per 50Kg of cement and applying bitumen coating of 80/100 grade using 1.7 kg/Sq.m. of bitumen after cleaning the surface with brushes, including splashing sand over bitumen including all labour and material complete. The bitumen coating shall be 1.7 kg/Sq.m.

14.1.1 DPC in wall foundation.

14.2 WATER FROOFING & ROOF FINISHES

Providing torch applied water proofing included with 3 mm thk bitumen membrane treatment finished with following 4 layers as per drawing No LIOC/ENG/STD/03.

L 1- 1:3 Cement: Sand leveling screed (25mm Thk)

L 2 -3mm thick Water proofing membrane

L 3 - 50mm Thk CM 1:3 rendering

L 4 - Liquid Acrylic Fexible Membrane (Two coats of Baralastic)

14.2.1 Water Proofing in roof slabs & RCC gutters.

14.3 P & L PRESSED CLAY TILES (TERRACOTA) ON ROOFS

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
88 of 225**

Providing and laying pressed clay tiles (as per approved pattern 20mm nominal thickness and of approved size) on roofs jointed with cement mortar 1:4 (1 cement : 4 coarse sand) mixed with 2% integral water (1 cement : 4 coarse sand) and finished neat, complete.

The tiles shall be laid over bed mortar 20 mm thick in CM 1:4 (1 cement: 4 coarse sand)

14.3.1 Providing and laying pressed clay tiles above the water Proofing.

15.0 PLASTERING WORKS

The plaster shall be finished to a true and plumb surface and the degree of smoothness required. For all inner walls, the surface shall be finished off with a rough wood float to extent to enable for providing putty while painting to obtain a smooth surface.

All external walls shall be troweled smooth without showing sign of trowel marks or waviness or folds.

The mix shall be as specified and the sand shall be sieved through a 2.36 mm sieve and for second and third coat of plastering shall completely pass through 1.18mm sieve.

Providing plastering, over brick, stone masonry, RCC, CC surface in plinth, super structure and roof including all leads and Lifts, shuttering, scaffolding, curing etc. complete.

15.1 WALL FINISHES (External Plaster - 16 mm thick)

Plaster with Cement Mortar 1:4, 16 mm thick.

External walls, columns, reveals narrow width fascia etc. with 20 mm thick cement and sand mortar 1:4 finished semi rough (Sponge Finish) with uniform texture.

15.1.1 External Plasters in walls.

15.1.2 External Plasters in boundary walls.

15.2 WALL FINISHES (Internal Plaster- 12mm thick)

Plaster with Cement Mortar 1:4, 12 mm thick.

Internal Walls, Columns, Soffit, reveals narrow width etc. with 12mm thick cement, and sand mortar 1:4, finished smooth with neat cement

15.2.1 Internal & Soffit Plaster at all places including scaffolding.

15.3 12MM THK PLASTERING FOR DRIP COURSE

Providing 12mm thick plastering for Drip course of size as per drawings but not less than a width of 20mm with cement mortar 1:4 including scaffolding, curing, finishing, etc. complete:

15.3.1 Providing 12mm thick plastering for Drip course.

15.4 CHIKEN WIREMESH FOR JUNCTION OF BRICK WORK & RCC WORK

Providing and fixing of 200mm wide chicken wire mesh of 24 gauge at the junction of brickwork and RCC work, including fixing with nails, roll plugs etc; before applying plaster.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
89 of 225**

15.4.1 Providing and fixing of 200mm wide chicken wire mesh.

15.5 COPING FOR COMPOUND WALL

Making coping for the top of compound wall in plain cement concrete Mix 1:2:4 up to 75mm thick, including cost of all materials, shuttering, labour scaffolding etc. and finishing with 12mm thick plastering in CM 1:4 as per standard drawings.

The work shall be executed as per the standard drawing No LIOC/ENG/STD/04. The work includes cost of concrete, shuttering & centering, plastering and finishing the coping portion, etc.

15.5.1 Coping border in boundary wall.

16.0 TILING WORKS

The tiles at the external corners shall be finished by chamfering the edge to avoid the exposure of thickness of tiles.

The bed plastering for the above shall be 12mm thick in order to have proper fixing and bedding for the tiles used.

The 'make' and 'grade' of the tiles shall be as specified in the general specification. The sample of the tiles shall be got approved by the LIOC Ltd./Consultant.

Cement mortar for preparing the bed of tiles, shall be in the proportion of 1:3 and shall be thoroughly mixed. This may be done with manually or by a mechanical mixer. The amount of water added shall be the minimum necessary to give sufficient plasticity for laying and compacting. A high water cement ratio will produce a screened bed with a high drying shrinkage. Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles.

The tiles shall be laid in uniform to match the horizontal/vertical lines . Necessary slope and gradient shall be maintained for all the rooms before laying of tiles.

16.1 COLOURED CERAMIC GLAZED WALL TILES

Providing and laying 1st quality ceramic glazed wall tiles of minimum of approved make in all colours/shades of minimum thickness 6mm of following sizes as approved by the Engineer-in-Charge in skirting, dado, risers, etc. over 12mm thick cement mortar 1:3 mix, jointing with grey cement slurry including pointing with tile joint filler of approved make and shade, cost of all materials, labour etc., complete

- i) The tiles shall be of approved makes. The samples of the tiles shall be got approved by LIOC.
- ii) The tiles at the external corners of tiles shall be finished by chamfering the edge to avoid the exposure of thickness of tiles.
- iii) The bed plastering for the above shall be 12mm thick in order to have proper fixing and bedding for the tiles used.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
90 of 225**

- iv) Pointing of the tile joints shall be done with tile joint filler of approved make, shade and quality.

16.1.1 200 x 300, minimum 6 mm thick wall tiles in Toilets - All floors.

16.1.2 200 x 300, minimum 6 mm thick wall tiles in Service Station.

16.2 HOMOGENOUS POLISHED CERAMIC FLOOR TILES

Providing and laying 1st quality ceramic floor tiles (including treads) of minimum thickness 9mm of approved make in all colours/shades of following sizes as approved by the Engineer-in-Charge over 20mm thick cement mortar 1:4 mix, jointing with grey cement slurry including pointing with tile joint filler of approved make and shade, of matching shade including cost of all materials, labour etc., complete

- i) The tiles shall be of approved makes. The samples of the tiles shall be got approved by LIOC.
- ii) Ceramic floor tiles shall be of specified size and of standard Abrasion resistance group III and above as per the clause of European standard EN 104. The tiles to be provided in toilet floors must be of anti skid type.
- iii) Cement mortar for preparing the bed of tiles, shall be in the proportion of 1:4 and shall be thoroughly mixed. This may be done with manually or by a mechanical mixer. The amount of water added shall be the minimum necessary to give sufficient plasticity for laying and compacting. A high water cement ratio will produce a screened bed with a high drying shrinkage. Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles.
- iv) The tiles shall be laid in uniform pattern to match the horizontal / vertical lines. Necessary slope and gradient shall be maintained for all the rooms before laying of tiles.
- v) Skirting shall be 100mm high generally and the joints shall perfectly match with the adjacent flooring. Mortar used shall be 1:3 cement mortar 12mm thick. Skirting shall be measured and paid separately under the same item
- vi) The tiles at the external corners of tiles shall be finished by chamfering the edge to avoid the exposure of thickness of tiles.
- vii) The cement mortar bed for the above shall be 20mm thick in order to have proper bedding for the tiles used.
- viii) Pointing of the tile joints shall be done with tile joint filler of approved make, shade and quality.

16.2.1 300 x 300X 9 mm Homogenous polished ceramic floor tiles in all floors.

16.3 HOMOGENOUS NON SKID CERAMIC FLOOR TILES

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
91 of 225**

Providing and laying 1st quality ceramic non skid floor tiles (including treads) of minimum thickness 9mm of approved make in all colours/shades of following sizes as approved by the Engineer-in- Charge over 20mm thick cement mortar 1:4 mix, jointing with grey cement slurry including pointing with tile joint filler of approved make and shade, of matching shade including cost of all materials, labour etc., complete

- j) The tiles shall be of approved makes. The samples of the tiles shall be got approved by LIOC.
- ix) Ceramic floor tiles shall be of specified size and of standard Abrasion resistance group III and above as per the clause of European standard EN 104. The tiles to be provided in toilet floors / walkway around building must be of anti skid type.
- x) Cement mortar for preparing the bed of tiles, shall be in the proportion of 1:4 and shall be thoroughly mixed. This may be done with manually or by a mechanical mixer. The amount of water added shall be the minimum necessary to give sufficient plasticity for laying and compacting. A high water cement ratio will produce a screened bed with a high drying shrinkage. Care shall be taken in the preparation of the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the tiles.
- xi) The tiles shall be laid in uniform pattern to match the horizontal / vertical lines. Necessary slope and gradient shall be maintained for all the rooms before laying of tiles.
- xii) Skirting shall be 100mm high generally and the joints shall perfectly match with the adjacent flooring. Mortar used shall be 1:3 cement mortar 12mm thick. Skirting shall be measured and paid separately under the same item
- xiii) The tiles at the external corners of tiles shall be finished by chamfering the edge to avoid the exposure of thickness of tiles.
- xiv) The cement mortar bed for the above shall be 20mm thick in order to have proper bedding for the tiles used.
- xv) Pointing of the tile joints shall be done with tile joint filler of approved make, shade and quality.

16.3.1 300 x 300X 9 mm Homogenous non skid ceramic floor tiles in Pavements (Walk way around the buildings).

16.3.2 300 x 300X 9 mm Homogenous non skid ceramic floor tiles in toilets in all floors.

16.4 FLOOR FINISHES (Skirting-Polished ceramic floor Tiles)

Skirting:

Skirting shall be 100mm high generally and the joints shall perfectly match with the adjacent flooring. Mortar used shall be 1:3 cement mortar 12mm thick.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
92 of 225**

300mm x 300mm x 9mm Tiles of approved colour and shade Supplying and lying Homogenous ceramic polished floor tiles of approved colour and quality. Rate to include cement bedding and grouting including all costs for material and labour

16.4.1 300 x 300X 9 mm Homogenous non skid ceramic Skirting tiling 100 mm high in all floors.

16.5 P&L 50MM THICK PCC FLOORING (ELECTRICAL ROOM)

The top surface shall be finished to required slope and the degree of smoothness required.

Granolithic floor finish bonded construction in CC 1:1:2 mix of 50 mm thick PCC flooring with graded stone aggregates of nominal size 12mm thick top layer, on the 100 mm thick under layer of Flooring base concrete 1:2:4 (20mm) including finishing of top surface with two coats of mastic floor paint of approved colour, rate shall include shuttering, curing, painting etc. complete.

16.5.1 Granolithic floor finish in electrical room.

17.0 GRANITING WORKS

17.1 S&F 10MMTHK MIROR POLISHED BLACK GRANITE

Supplying and fixing of 10mm thick mirror polished black granite tiles for pump island edges etc. over 12mm thick CM 1:4 including cost of all materials and labour etc. complete.

- i) Granite tiles shall be of uniform shade and grains. The samples of the tiles shall be got approved by LIOC.
- ii) The grains of adjacent tiles should match wherever possible. The tiles at the external corners of tiles shall be finished by chamfering the edge to avoid the exposure of thickness of tiles.
- iii) The bed plastering for the above shall be 12mm thick in order to have proper fixing and bedding for the tiles used.
- iv) Pointing of the tile joints shall be done with tile joint filler of approved make, shade and quality.

17.1.1 10 MM Thick Jet Black granite.

17.2 S&F 20 MM MIROR POLISHED BLACK GRANITE

Supplying and fixing of mirror polished black granite slab of 18-20 mm thick for pump island including bedding in cement mortar 1:4, 20mm thick as per standard drawings and cost of all material and labour etc., complete

- i) Granite slab shall be of uniform shade and grains. The samples of the slab shall be got approved by LANKA IOC PLC.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
93 of 225**

- ii) The cement mortar bed for the above shall be 20mm thick in order to have proper bedding for the tiles used.
- iii) The grains of adjacent slabs should match wherever possible. Width of the slab shall not be less than the width of the pump island.
- i) Pointing of the slab joints shall be done with white cement mixed with pigment to match the shade of the tiles.

17.2.1 18 - 20 MM Thick Jet Black granite.

17.3 PROVIDING EDGE NOSING FOR GRANITE SLABS

17.3.1 Half round edge nosing (Quarter portion of circle).

17.3.2 Full round edge nosing (Half portion of circle).

- i) Nosing of the granite slab as per the standard drawing or as directed by the Engineer.
- ii) The finishing of the nosing shall be same as that of the mirror polished slab.

18. ALUMINIUM WORKS & STRUCTURAL GLAZING:

Doors And Windows

Outer frame members shall be miter cut with 45 degrees angles and reinforced with extruded Aluminium corner cleats securely jointed by mechanical crimps. Intermediate mullion and transom bars are square cut, machined and securely fixed to outer frame with self tapping screws driven into screw receptacles in the profile joints shall be sealed against entry of water. Glazing beds shall be angled to minimize dust concentration and air condition water sheds.

Where the size of door leaves exceed the recommended sizes and weights of the manufacturer, profiles should be reinforced with manufacturer's standard reinforcing extrusions.

Weep holes not visible to exterior for draining water shall be provided. No screws shall be visible. Rivets shall not be used in joinery. Perimeter sections that are in contact with the structure shall be fitted with suitable space fillers such as polystyrene or equivalent.

Marginal allowance of 5mm or as recommended by the sealant manufacture shall be allowed when confirming the overall size of the window. All pivoted doors shall be provided with concealed door closer with hold and open facility unless otherwise specified. All shop-front doors shall be provided with standard manufacturers thresholds with suitable backing strips.

The Aluminium works under this section shall conform to BS 4873:1972 and BS 5286 for Aluminium alloy windows and should be from a proprietary system/s from a reputed manufacturer.

The performance of the Installation shall conform to BS 6375 part 1 for weather tightness, BS 6375 part 2 for operation and strength characteristics, BS 5368 part 3 for wind resistance test, BS 5368 part 2 for water tightness, BS 5368 part 1 for air permeability test.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
94 of 225**

Materials

Extrusions

Extrusions shall conform with BS 1474 for Powder coated Aluminium alloy HE 9TF or HE 9TE.

Weather-strips and Gaskets

The gaskets shall be made from high grade PVC material to resist the arduous conditions conforming to BS 4255 part 1 1968. External gasket shall act as water shed and any internal glazing wedges or gaskets shall prevent any further penetration of air and shall form an air seal. Weather stripping for sliding doors and shop-front doors shall be provided with poly-propylene backed woven pile set in undercut grooves in frames and profiles.

Sealants

Sealants shall conform to BS 5215: 1975 and BS 5889:1980. Sealants for general sealing work shall be 1 part, gun applied neutral curing sealants, which cures by absorption of moisture from atmosphere. Structural glazing silicone sealants shall be 2 part variable cure rate, high modulus, elastomeric sealants with excellent performance properties. Where sealants are to be used at joints on fire checks/fire resistant doors/fire barriers, they shall be of fire resistant quality, reinforced with inorganic fillers and fire retarding chemicals. The curing period for general sealants shall be 2-4 weeks under average conditions of humidity and temperature. After being fully cured, the sealant shall be able to accommodate movements and maintain a long lasting tough weatherproof seal. The joints made with sealants shall not be less than 6 mm depth and the width of the joint shall not be less than 4 times the expected movement and shall not be less than 6 mm wide. Joints shall be designed generally so that the depth of the sealant is half the width. Where joints are deep in comparison to width, a back up material such as polyethylene strips shall be used. It shall be resistant to petrol, diesel, jet fuel, vegetables oils and other most weak alcoholic and dilute acids and shall not form stain on materials such as concrete, masonry, stone or wood. Sealants shall have tack free time of 48 hours under average conditions.

Backing rods shall be provided to receive sealants at joints of perimeter section to structure.

Hardware

Casement windows shall be hung from concealed stainless steel, variable geometry adjustable friction stays with nylon friction pads. Restrictor stays shall be provided for limited opening with extruded Aluminium loading handles.

Metal to metal contact shall be avoided to ensure smooth operation by means of friction pads of thermo-plastic resins.

All hinges, locks, catches, handles, furniture, latches, opening devices lever systems and other remote control devices, stays, pulls, door closers, floor springs, safety bars etc., required for specific operation and screws, nuts, washers, bolts, rivets, hardware and other miscellaneous fasteners shall be of Aluminium, stainless steel or other non corrosive material compatible with Aluminium alloy and shall be of sufficient strength to perform the functions for which they are used.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
95 of 225**

Sliding sashes of sliding doors should be on nylon rollers with stainless steel spindles set into roller carriage let into the bottom rail of sash. They should be provided with safety catches to restrict opening of sliding pore to two positions.

Coating and Finishes

Anodic oxide coatings shall conform with BS 3987:1974 for external applications.

Powder organic coatings for application and storing Aluminium alloy extrusions sheet and pre-formed sections for external architectural purposes shall comply with BS 6496. The powder coating shall have a minimum thickness of 60 microns.

Glazing

Unless otherwise specified, glazing work shall comply with BS 6262 for thickness and type. Glass panes of casement windows shall be fitted with PVC gaskets for external beads and by hard flexible vinyl or similar wedges gaskets for internal beads. Drainage to the exterior shall be provided.

Glass panes in sliding system shall be set in extruded rubber channel gasket held in channel form receptacles in Aluminium profiles and factory assembled.

ALUMINIUM WORKS-GENERAL:

Supply & fixing Aluminium Doors, Windows & Partitions made of powder coated aluminium sections of minimum coating thickness 15 microns complete. Item includes all fittings and accessories complete as specified in detailed description.

General

- i) All aluminium sections shall be of approved make as per standard drawings.
- ii) All Aluminum sections shall be extruded tubular hollow sections conforming to latest SLS specifications. All sections shall be approved by LIOC before placing the order. All extruded sections shall have minimum wall thickness as specified. All sections shall be smooth, rust free, straight, mitred and mechanically jointed wherever required.
- i) The aluminum sections shall be powder coated (as per SLS) in natural matt finish with film thickness of minimum 15 microns, unless otherwise specified.
- ii) Plain float glass, 12mm both sides laminated exterior grade particle board & sandwich panel of approved make consisting of marine ply core not less than 3 mm thick faced with 20 gauge Powder coated sheets on both faces of approved makes only shall be used for glazing/ paneling wherever specified.
- iii) Item includes fixing with rawl plugs & CP Brass/ SS screws or with fixing clips or with expansion hold fasteners including necessary filling up gap at junctions, top, bottom &

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
96 of 225**

sides wherever required with PVC/Neoprene felt including cleat angle, aluminium snap for beading etc.

- iv) The edge of the glass at the frame less vertical joint of the glass shall be polished and clear silicon sealant shall be applied at the vertical joint of the glass.

18.1 DOORS & WINDOWS (GLASS DOORS)- D1

Fully glazed Entrance door using 12mm thick toughened glass entrance door including cost of SS floor springs, all accessories and as per standard approved drawings with SS floor & top spring, door handles & floor lock.

Supply and fixing fully glazed Entrance door using 12mm thick toughened glass including all necessary accessories such as hydraulic floor spring, door stopper, Godrej door lock (Catalogue No 9158 LKYLDMNSD Narrow Stile Mortice Lock), beadings, handles, PVC / Neoprene gasket, etc. complete as per drawings (Refer to drawing No. LIOC/ENG/STD/05).

18.1.1 Glass doors-Type - D1

18.2 DOORS & WINDOWS (ALUMINIUM DOORS)-D2

Fully glazed doors using 5 mm thick glass including all accessories

Supply & fixing of fully glazed doors of colour powder coated aluminium sections (15 microns powder coating thickness) using 5 mm thick plain float glass and aluminium frame including all necessary accessories such as Stainless Hinges, SS door stopper, Godrej door lock (Catalogue No 9158 LKYLDMNSD Narrow Stile Mortice Lock), beadings, SS handles, SS screws, rawl plugs, pivots, glazing clips, concealed tower bolt, PVC / Neoprene gasket, etc complete as per drawings (Refer to drawing No. LIOC/ENG/STD/06).

18.2.1 Aluminium Doors - Type - D2

18.3 DOORS & WINDOWS (ALUMINIUM DOORS)- D3 & D4

Fully glazed or partly panel doors using 5 mm thick glass including all accessories

Supply & fixing of fully glazed or partly panel doors of colour powder coated aluminium sections (15 microns powder coating thickness) using 5 mm thick plain float glass and aluminium frame including all necessary accessories such as Stainless Hinges, SS door stopper, Godrej door lock (Catalogue No 9158 LKYLDMNSD Narrow Stile Mortice Lock), beadings, SS handles, SS screws, rawl plugs, pivots, glazing clips, concealed tower bolt, PVC / Neoprene gasket, etc complete as per drawings (Refer to drawing No. LIOC/ENG/STD/07).

18.3.1 Aluminium Doors - Type – D3 & D4

18.4 DOORS & WINDOWS (ALUMINIUM DOORS)- D5

Fully glazed or partly panel doors using 5 mm thick glass including all accessories

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
97 of 225**

Supply & fixing of fully glazed or partly panel doors of colour powder coated aluminium sections (15 microns powder coating thickness) using 5 mm thick plain float glass and aluminium frame including all necessary accessories such as Stainless Hinges, SS door stopper, Godrej door lock (Catalogue No 9158 LKYLDMNSD Narrow Stile Mortice Lock), beadings, SS handles, SS screws, rawl plugs, pivots, glazing clips, concealed tower bolt, PVC / Neoprene gasket, etc complete as per drawings (Refer to drawing No. LIOC/ENG/STD/08).

18.4.1 Aluminium Doors - Type – D5

18.5 DOORS & WINDOWS (FIXED GLAZING)

Fixed glazing with 12mm Thick Plain Float Glass as per approved drawings

Supplying and fixing of fixed glazing (with Stainless steel supporting railings) with 12 mm thick plain float glass of approved section as per drawing (Refer to drawing No.LIOC/ENG/STD/09) including SS supporting railings, necessary SS glazing clips, PVC / neoprene gasket, with SS sections as per drawings, other necessary hardware etc., complete. Silicon sealant shall not be used at glass junctions.

18.5.1 12 MM thick Fix Glazing at sales building

18.6 DOORS & WINDOWS (ALUMINIUM WINDOW)-W1

Casement Window with 5 mm thick glass including all accessories

Supply & fixing of casement window of colour powder coated aluminium sections (15 microns powder coating thickness) using 5 mm thick plain float glass with necessary hardware like Stainless Steel friction hinges of approved make and quality, rubber gaskets, SS screws, SS locks, rawl plug etc, as per drawing including cost of all materials and labour charges etc., complete. (Refer to drawing No. LIOC/ENG/STD/10)

18.6.1 Aluminium Window - Type - W1

18.7 DOORS & WINDOWS (ALUMINIUM VENTILATOR)

Adjustable louvered ventilators with 4 mm thick pinheaded glass including all accessories
Supply & fixing of adjustable louvered ventilators of powder coated aluminium sections (15 microns powder coating thickness) with 4 mm thick pinheaded glass including necessary accessories like screws, rawl plugs, anodised aluminium adjustable louver mechanism, all labour charges, sundries, etc. complete as per approved drawings. (Refer to drawing No. LIOC/ENG/STD/11)

18.7.1 Aluminium Ventilator - Type - V1.

18.8 ALUMINIUM PARTITIONS

Partly glazed (5mm thick) and partly paneled partitions using 12 mm thick double skin both side laminated exterior grade particle board as per approved drawings

Supply & fixing of partly glazed and partly panelled partitions of colour powder coated aluminium sections (15 microns Powder coating thickness) using 5 mm thick plain float glass

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
98 of 225**

and 12 mm thick both side laminated exterior grade particle board as per approved drawings (Refer to drawing No. LIOC/ENG/STD/11), including aluminium frame, necessary aluminium glazing clips, PVC / neoprene gasket, with aluminium mullion between the glass and particle board, other necessary hardware etc., complete.

18.8.1 Partly Aluminium & Partly Glass Double skin Partition

18.9 PROVIDING & FIXING ROLLING SHUTTER

Providing & Fixing rolling shutter made out of 18 gauge steel sheets for laths including all fittings as per IS Code: 6248:1979 including painting with 2 coats of zinc phosphate and 2 coats of synthetic enamel complete

Supplying, handling and fixing rolling shutters made out of 18 Gauge, 75mm wide MS cold rolled lathe interlocked together through their entire length and jointed together at the ends mounted on specially designed pipe shaft with heavy duty flat springs encased in suitable MS sheet box cover complete with bracket plates, guide channels and arrangements for inside and outside locking with push / pull operation or mechanical device chain and crank operation along with handle lever etc. complete including cost of wire spring and hood over for the shutters. Item includes fixing the shutter with the help of 150mm long, 25 x3mm MS lugs embedded in 100 x 100 x 150mm size CC 1:2:4 blocks. Painting 2 coats of synthetic enamel paint (matt finish) over 2 coats of zinc phosphate primer. MS grills as applicable shall be grills made out of 8 mm MS bars and MS flats

Measurements shall be taken for the size of the opening only. Approved make only shall be utilized and no local fabrication shall be accepted.

18.9.1 Manually operated RSD (Self-coiling type rolling shutter with or without grill of size 600mm high).

18.9.2 Mechanically operated RSD (Gear operated type-rolling shutters with gear box and crank handle at waist level on outside with or without grill of size 600mm high).

19.0 PAINTING WORK

Surface preparation for walls:

A stiff coir / wire brush shall be used to ensure that the surface is clean of all loose dirt, grease, fungi, algae and flaking paint. The exterior surface shall not be affected by water seepage and constant dampness for paint performance. In case of rains, two to three days of total sunshine shall be allowed before painting. All the cracks shall be filled up before taking up the painting.

Water jetting, if required, shall be used to clean the surface. If water jetting is adopted, minimum 2 days of drying time should be given before taking up the painting.

If the existing paint is enamel, it is essential to scrap and remove all the paint completely before taking up re-painting.

Surface preparation for wooden / metal surfaces:

Sand or emery paper shall be used to ensure that the surface is clean all loose materials, grease etc. In case of rains, two to three days sunshine shall be allowed before painting.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
99 of 225**

Priming:

Once the wall is smooth and dry, a coat of water solvent cement primer shall be applied and the primer surface shall be allowed to dry overnight. It shall be ensured that the surface is smooth and free from undulations before applying finishing coat.

All items include the following jobs:

- i) The item includes supply of all essential materials required for carrying out the painting work including, brushes, cans etc.
- ii) Providing and erecting of all kind of scaffolding required irrespective of all height involved.
- iii) Nails shall be removed and plugging of all nail holes, cracks filled with acrylic putty / crack filler.
- iv) Furniture, Door, Window, Floor etc. shall be protected from being splashed by primer / paint and cleaned after painting.

19.1 PAINTING WORK (EXTERNAL WALLS)

Surface preparation, supplying & painting two coat of exterior acrylic emulsion paint for exterior surfaces as per specifications and of approved colour and make including scraping, scaffolding etc. complete.

The item includes the following works:

- i) Surface preparation works.
- ii) Supply and applying of required no. of coats of exterior acrylic emulsion paint with paint to water ratio as per manufacturer's specification. Duration of four hours shall be allowed as drying period between the coats. Application shall be allowed by brush/roller.
- iii) Coverage: 5Sqm to 7 Sqm / Litre / two coats.

19.1.1 External Painting walls.

19.2 PAINTING WORK (INTERNAL WALLS & SOFFITS)

Surface preparation, supplying & painting one coat of cement primer and two coats of wall putty and two coats of interior acrylic emulsion paint for interior surfaces, as per specifications, and of approved colour and make, including scraping, scaffolding etc. complete.

The item includes the following works:

- i) Surface preparation works.
- ii) Applying one coat of cement primer.
- iii) Two coats of approved wall putty.
- iv) Supply and applying of required no. of coats of interior acrylic emulsion paint with paint to water ratio as per manufacturer's specification. Duration of four hours shall be allowed as drying period between the coats. Application shall be allowed by brush/roller. Final coat shall be done with roller.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
100 of
225**

v) The plastic emulsion paint shall be of approved manufacture conforming to latest IS standards. The shade shall be as specified by the Engineer as per IOC standard colour scheme.

vi) Finishing:

In case of Asian Paints Apcolite Royale Acrylic it should be thinned in the ratio of 8 parts of paint with 3 parts of water by volume and apply two coats at an interval of four hours between the coats.

In case of Asian Paints Apcolite Acrylic and ICI paints Dulux Acrylic, apply two coats of Acrylic emulsion thinned with two parts paint to one part water for the first coat and four parts paint to one part water for the second coat. Allow four hours drying time between the coats. Application by brush, roller or air less spray.

In case of ICI paints Dulux Velvet Touch, Acrylic apply two coats of paint thinned with 6 parts of paint and one part of water. Allow Four hours drying time between coats. Application by brush, roller or air less spray.

viii) Coverage:

Paint	Sqm. / Litre / two coats
Asian Paints Royale Acrylic	19 to 20
ICI Paints Velvet touch Acrylic	11 to 13
Asian Paints Apcolite Acrylic	10 to 16
ICI Paints Dulux Acrylic	10 to 12

19.2.1 Internal Painting of Buildings.

19.3 PAINTING WORK (SYNTHETIC ENAMEL PAINTING)

Providing painting two coats synthetic enamel paint over two coats of matching primer on new steel / masonry / wood / pvc work including cost of all material, labour, scraping, scaffolding, etc. complete.

The item includes the following:

- i) Surface preparation works.
- ii) Two coats of matching primer with required coat of putty approved by LIOC.
- iii) Two coats of synthetic enamel paint over priming coat already applied.
- iv) Only ready mix paint confirming to IS specification and approved by site Engineer shall be used.
- v) Mixing of kerosene oil with paint is strictly prohibited.

19.3.1 Enamel Painting (Synthetic enamel).

20.0 PLUMBING WORKS

SPECIFICATIONS FOR PLUMBING WORKS

STANDARDS

Several national international standards have been quoted in the specifications. All workmanship materials and components throughout shall where applicable and unless

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
101 of
225**

otherwise stated in the specification comply with the relevant American, Indian, British or Sri Lanka Standards, current on the date fixed for receipt of tenders together with additional clauses or amendments set out in the specifications.

Order or precedence of the standards shall be as follows:

1. Sri Lanka Standards
2. British Standards
3. Indian Standards
4. American Standards

Tenderers may offer materials in accordance with such other standards or specifications, which provide for quality and workmanship not inferior to the standards quoted together with the additional clauses or amendments set out in these specifications. Such standards or specifications shall be submitted in full at the time of tendering. Authenticated English translation shall be submitted if the specifications are in other languages.

When reference is made within these documents to certain standards, specifications or regulations, the reference shall be construed to mean the standard with all subsequent amendments and changes or additions as thereafter adopted and published that are in effect at the date fixed for receipt of tenders.

Tenderers are instructed that any clarifications and/or additional information etc. pertaining to the scope of work should be obtained fully before tender submission and that the quality and quantum of work which should be per the above standards properly understood since no extra works would be permitted due to any subsequent clarifications of lack of information.

20.1 SUPPLY & FIXING OF THE FOLLOWING PVC PIPES

Supplying and fixing of following PVC pipes of specified diameters (15 kg/cm², 10 kg/cm², 6 kg/cm²) including all PVC bends, elbows special arrangements, complete. PVC pipes for soil/waste connections shall be as per IS 13592:1992 & IS 14735:1999). PVC pipes for potable water supplies shall conform to IS 4985:2000 & IS 7834:1987). The rate also includes cutting chases in walls and making good the same, necessary earthwork, clamps, scaffolding etc.

- 20.1.1 20mm dia. PVC pipe (15 kg/cm²).
- 20.1.2 25mm dia. PVC pipe (15 kg/cm²).
- 20.1.3 32mm dia. PVC pipe (10 kg/cm²).
- 20.1.4 50mm dia. PVC pipe (6 kg/cm²).
- 20.1.5 80mm dia. PVC pipe (6 kg/cm²).

20.2 PLUMBING WORK (WASTE & STORM WATER)

Providing and fixing UPVC pipes (IS: 13592) soil, waste and vent pipe including all fittings (plain or door) e.g. bends, junction, cowls, offsets, access pieces, jointing with solvent cement/rubber rings, G.I.supports including cutting chase or holes in walls and floors and RCC Slab making good where required.(for soil & waste water pipe inside the building)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
102 of
225**

20.2.1 110 mm dia. UPVC pipe -Sewer Pipe.

20.2.2 110 mm dia. UPVC pipe - Storm water Pipe.

20.2.3 80mm dia UPVC pipe - Waste Water.

20.2.4 50mm dia UPVC pipe - Waste Water.

20.3 PLUMBING WORK (HDPE O/H WATER TANK)

Supplying and installing of H. D. moulded polyethylene tank, "SINTEX" or equivalent approved make water storage tank of following capacities including all fittings like drain plug etc., placing on plain hard surface, etc. complete

Supplying and installing of approved make H.D. moulded polyethylene water storage tank of specified capacity including all fittings like drain plug etc. The tank has to be placed only on plain hard surface. If plain hard surface is not available, brick masonry level platform shall be provided by the contractor, for which separate payment under item rate shall be made.

20.3.1 Capacity 500 Lt HDPE water tank.

20.3.2 Capacity 1000 Lt HDPE water tank.

20.3.3 Capacity 2000 Lt HDPE water tank.

20.4 PLUMBING WORK (MUNICIPAL WATER CONNECTION)

Obtaining water connection from Municipal including obtaining necessary approval & coordination etc.

20.4.1 Water connection - 25 mm Dia or as permitted by authorities

21.0 SANITARY FITTINGS & FIXTURES

21.1 VITREOUS CHINA EUROPEAN TYPE WC

Providing & fixing white / colored wash down WC (European type WC pan Ordinary or wall hung extended type European type WC pan as per IS 2556) with integral "P or S" trap as per item specification including jointing the trap with soil pipe in cement mortar 1:1 (1 part of cement : 1 part of fine sand), white / coloured bakelite/ plastic seat & cover with CP brass hinges & rubber buffers. Item includes provision of 10 litres ceramic close couple flushing cistern (white / matching colour) as per IS 7231 fixed with a pair of anchor bolts, complete with fittings such as syphon, 15mm angle valve, syphon, 15 mm nominal size brass ball valve with lever and PVC float, coupling for connection, (valveless fittings complete) with inlet, out flow pipes including connecting the flush with cistern & closet & making good the floor & wall surface. Item includes removing the old fittings in case of replacement without any extra cost.

21.1.1 Providing & fixing first quality white vitreous china European type WC pan with 10 litre ceramic close couple flushing cistern and seat cover with all fittings as per detailed specifications.

21.2 EUROPEAN TYPE SQUATING PAN

Providing & fixing white / colored wash down ceramic(European type Squatting pan Ordinary type) with integral "P or S" trap as per item specification including jointing the trap with soil pipe in cement mortar 1:1 (1 part of cement : 1 part of fine sand), with rubber buffers. Item

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
103 of
225**

includes provision of 10 litres ceramic High level PVC flushing cistern (white / matching colour) fixed with a pair of anchor bolts, complete with fittings such as syphon, 15mm angle valve, syphon, 15 mm nominal size brass ball valve with lever and PVC float, coupling for connection, (valveless fittings complete) with inlet, out flow pipes including connecting the flush with cistern & closet & making good the floor & wall surface. Item includes removing the old fittings in case of replacement without any extra cost.

21.2.1 Providing & fixing first quality white European type Squating pan with 10 litre PVC high level flushing cistern and seat cover with all fittings as per detailed specifications.

21.3 FLAT BACK WASH BASIN

Providing & fixing white / coloured flat back wash basin, (as per IS 2556) with CI brackets /anchor bolts, of size 550 x 400mm with 1 No. 15mm CP brass pillar tap long neck foam flow, 15mm CP angle valve, brass chain with rubber plug, 32 mm CP brass waste coupling of standard pattern, 32mm CP brass bottle trap of standard pattern & unions complete, including cutting & making good the wall & floor surface wherever required. Item includes removing the old fittings in case of replacement without any extra cost.

21.3.1 Providing & fixing white flat back wash basin of size 550mm x 400mm with CI brackets /anchor bolts with 15mm CP brass pillar tap and angle valve, CP brass waste coupling with rubber plug, pattern, 32mm dia CP brass bottle trap & its unions, including cutting & making good the wall & floor surface/ tiled surface wherever required. (Item includes removing the old fittings in case of the replacement without any extra cost.).

21.4 FLAT BACK OR CORNER TYPE URINAL

Providing & fixing white / coloured vitreous china flat back or wall corner type lipped front urinal basin (as per IS 2556) of 430 x 260 x 350mm size & 410 x 265 x 340mm size respectively with 15 mm angle drain pipe with waste coupling, standard size CP flush pipe and GI clamps complete including cutting & making good the wall & floor surface. Item includes removing the old fittings in case of replacement without any extra cost.

Providing & fixing white vitreous china flat back or wall corner type lipped front urinal basin of the following sizes with drain pipe and all fittings complete as directed by LANKA IOC PLC. (Item includes removing the old fittings in case of replacement without any extra cost)

21.4.1 430 x 260 x 350mm size flat back urinal.

21.4.2 430 x 265 x 340mm size angle back urinal.

21.5 SUPPLY & FIXING OF THE FOLLOWING SANITARY FITTINGS

Supplying & fixing the following of approved quality fittings as per LIOC's requirements and instructions.

Item includes removing the old fittings in case of replacement without any extra cost.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
104 of
225**

- 21.5.1 Providing & fixing 600mm x 500mm and min. 5.5mm thick bevelled edge mirror of approved make with 6mm thick approved marine ply backing, CP brass hanging hooks, fixing screws, etc.
- 21.5.2 Providing & fixing CP brass towel rail, of 1.25mm wall thickness pipe & 500mm long. The CP brass pipe shall be 20 mm dia fixed on CP brass brackets fixed with rawll plugs with SS screws.
- 21.5.3 CP Robe Hooks of appd. make & quality.
- 21.5.4 Providing & fixing white vitreous china recessed pattern soap tray of size 216 x 108mm.
- 21.5.5 Supplying & fixing best quality PVC floor trap (Multi trap) of 100mm inlet and 75mm outlet of self cleansing design including cost of cutting making good walls & floor surface.
- 21.5.6 Providing & fixing overhead CP adjustable spray shower of approved make & quality with shower arm.
- 21.5.7 Providing & fixing 20 mm CP brass concealed stop cock with wall flange of approved make & quality.
- 21.5.8 Providing & fixing CP brass health faucet (hand bidet spray) with flexible PVC connecting pipe, wall hook and 1 no.15mm CP brass angle valve with wall flange of approved make & quality.
- 21.5.9 Providing & fixing 15 mm CP brass pillar cock of appd. make & quality.
- 21.5.10 32mm dia CP brass bottle trap & its unions of appd. make & quality .
- 21.5.11 25mm Ball float valve for O/H tank of appd. make & quality .
- 21.5.12 40mm Brass stop valves complete of appd. make & quality.
- 21.5.13 20mm Brass stop valves complete of appd. make & quality.
- 21.5.14 Providing & fixing 15 mm CP brass angle valve of appd. make & quality.
- 21.5.15 Providing & fixing 15 mm CP brass long body bib cock of approved make & quality.
- 21.5.16 Providing & fixing 15 mm CP brass short body bib cock of approved make & quality.
- 21.5.17 Flexible Hose (45cm) with braided metallic cover of approved make & quality.
- 21.5.18 Providing & fixing CP brass toilet paper holder of appd. make and quality.
- 21.5.19 Providing & fixing 15 mm CP brass concealed stop cock with wall flange of approved make & quality .
- 21.5.20 Providing and fixing solid plastic seat and lid of approved make for European type WC pan including all charges.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

Page
105 of
225

21.5.21 Providing & fixing 10 liters white PVC flushing high level cistern including supporting brackets/ anchors , mosquito proof coupling of approved make, pull handle, etc. complete.

22.0 STEEL WORKS

GENERAL

The structural works described hereunder is the Scope of Works for the project.

DESIGN

DESIGN: The structural steelwork shown on the drawings and described in this specification has been designed to BS 449.

SLIP FACTOR: A slip factor of 0.45 has been used in the design of friction grip joints.

DEFINITIONS

SHOP DRAWING: Drawings showing all necessary information to fabricate the structural steelwork.

CONTRACTORS DRAWINGS

Approval by the Consultant of drawings prepared by the Contractor does not relieve the contractor of the responsibility for accuracy of detail dimensions on drawings, nor for the general fit up of parts to be assembled on site.

GENERAL REQUIREMENTS

CODE OF PRACTICE: Comply with BS 449 and this specification. In case of conflict, the requirements of this specification take precedence.

CONSTRUCTION INFORMATION

FABRICATION: Provide the following information at least 2 weeks before commencing fabrication.

Complete and Co-coordinated shop drawings.

Details of welding procedures in accordance with BS 5135 for all welds.

QUALITY CONTROL

WELDERS: All welders employed for the project should possess valid certificate issued by an appropriate authority.

All welds are to be tested by the Inspecting Authority in accordance with the following schedule.

Butt welds: All butt welds are required to be tested.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
106 of
225

Fillet weld: 20% of the total lengths of all fillet welds to be selected by the Consultant are required to be tested.

MATERIALS – SECTIONS PLATES BARS

HOT ROLLED SECTIONS, PLATES AND BARS: Steel to BS 4360. Quality grades as noted on the drawings.

DIMENSIONS AND TOLERANCES

PLATES AND BARS : to BS 4360
HOT ROLLED SECTIONS : to BS 4 Part 1
ANGLES : to BS 4848 : Part 4
HOLLOW SECTIONS : to BS 4848 : Part 2

CONDITION OF STEEL: Steel for fabrication is not to be more heavily pitted or rusted than grade C of Swedish Standard 05 59 00.

MATERIALS – STRUCTURAL FASTNERS

ORDINARY BOLTS AND NUTS: to BS 3692 Grade 8.8. Dimensions may be in accordance with BS 4190.

HIGH STRENGTH FRICTION GRIP BOLT: to BS 4395:Part 2

WASHERS: to BS 4320 with ordinary bolts.

SPRING WASHERS: to BS 4464

SURFACE FINISH

GALVANIZED: bolt assemblies are to be galvanized in accordance with BS 729.

MATERIALS

WELDING CONSUMABLES: All welding consumables used for the arc welding of carbon manganese steels are to comply with BS 5135.

MECHANICAL PROPERTIES: Welding consumables and procedures are to give mechanical properties for the deposited weld metal not less than minimal specified for the parent metal.

GROUT

Grout is have a minimum compressive strength at 28 days of 60 N/mm² and is to be of the following form. The grout is to be pressure grouted Conbextra GP manufactured by FOSROC Construction Chemicals or equivalent approved by the Consultant.

WORKMANSHIP

IDENTIFICATION

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
107 of
225**

MARKING: Mark all materials to ensure that they are used as specified.

DOCUMENT: provide all mill certificates and manufacturer's certificates to show evidence of materials are provided as specified. Mill certificates and manufacture certificates shall be provided by the Contractor for each batch of steel materials delivered to the site. Steel materials delivered to the site, if not accompanied by any certificates shall be rejected.

STORAGE

Steelwork shall be kept in a clean place and in manner to prevent damage to the steelwork.

WORKMANSHIP - GENERAL

CUTTING

PROCESS: Cut steel by an automatic or semi-automatic process.

HAND FLAME CUTTING: Use only when approved by the Consultant.

GRINDING: remove burrs, sharp arises and ragged edged by grinding.

ACCURACY OF FABRICATION

ACCURACY: fabricate steelwork to an accuracy that will enable erection within the specified limits to take place without inducing excessive stresses, deflection or distortion into the structure.

LENGTH: members with both ends to be supported by existing structure or other proposed steelwork are not to deviate from the detailed length by more than 3mm for members 10m or less, 4mm for members greater than 10m in length.

STRAIGHTNESS: the deviation of a member from a straight line drawn between both ends of the member is not to exceed the greater of 3mm or 0.1% of the distance between both ends of the member.

WORKMANSHIP – WELDING

GENERAL

ARC WELDING: arc welding of carbon and carbon manganese steels is to comply with BS 5135.

WELDING PROCEDURES

WELDING PROCEDURES: approved to BS 4870: part 1 by the Contractor.

DISTORTION: Welding procedures and sequence of fabrication are to be such that distortion is reduced to a minimum.

WELDERS: approval tested to BS 4871: part 1

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
108 of
225**

WELDING CONSUMABLES: store, handle and use in accordance with the manufacture's recommendations.

TACK WELDING: to comply with BS 5135

TEMPORARY ATTACHMENTS: welding of temporary attachments required for fabrication or erection is to comply with BS 5135.

BUTT WELDS: use run-on and run-off plates in making butt welds to ensure full throat thickness at the ends. They are to comply with the following requirements.

The specification for the plates is to be identical to that for the material being welded.

The plates are to be prepared in the same manner as the parts being joined.

After completion of welding the plate are to be removed by cutting. The surfaces where they were attached are to be ground smooth and inspected for cracks.

REMOVAL OF SLAG: remove slag by light hammering, wire brushing or other methods that do not deform the surface of the weld.

WORKMANSHIP – BOLTING

HOLES

FORMING: drill or punch and ream all holes unless agreed otherwise.

SIZE: holes for ordinary bolts are to be of diameter not more than 2mm greater than the diameter of the bolt for bolts up to 24mm diameter, and not more than 3mm greater than the diameter of the bolt for bolts over 24mm diameter, except in steel base plates and where noted on the drawings.

HSFG FASTENERS: holes to comply with BS 4604.

MAKE UP OF BOLT ASSEMBLIES: for all bolt assemblies the strength grade combination of bolt/nuts/washers is to be as prescribed or recommended in the relevant British Standard.

CONDITION OF BOLTS: bolt assemblies are to be in such condition immediately before installation that the nut turns freely on the bolt.

GALVANISED NUTS: re-tap nuts in galvanised bolt assemblies after galvanising.

WASHERS

WASHERS: each bolt assembly is to contain at least one washer placed under the part being rotated.

TAPER WASHERS: place under bolt heads and nuts bearing on surfaces sloping 3 degrees or more from a plane at right angles to the bolt axis.

**SIGNATURE OF TENDERER
SEAL**



INSTALLATION OF SPRING WASHERS: tighten bolt assemblies containing spring washers until the spring washer is completely flattened.

LOCKING OF NUTS: secure nuts used in connections subject to vibration or reversal of stresses to prevent loosening. If not specified on the drawings include the proposed method in the erection details.

LIMITS TO LENGTH: the length of bolt is to be such that at least one clear thread shows above the nut after tightening, and at least one thread plus the thread run out is clear between the nut and the unthreaded shank of the bolt.

HIGH STRENGTH FRICTION GRIP FASTENERS

USE: the use of high strength friction grip bolts is to comply with BS 4704

TIGHTENING METHOD: tighten high strength friction grip bolts using the 'torque-control' method.

LOAD INDICATING WASHERS: use in accordance with the manufacturer's recommendations.

DISCARDED BOLT ASSEMBLIES: if after tightening a bolt or nut is slackened off for any reason the complete bolt assembly is to be discarded and not re-used in the works.

WORKMANSHIP-ERECTION

GENERAL: check before erection of any steelwork that work abutting the steelwork to be erected has been correctly placed in position and level.

ERECTION STRESSESS: not exceed the stress limit given in BS 449 during handling and erection.

ALIGNMENT: align each part of the structure as soon as practicable after it has been erected. Do not make permanent connections between members until sufficient of the structure has been aligned, leveled, plumbed and temporarily connected to ensure that members will not be displaced during the subsequent erection or alignment of the remainder of the structure.

THERMAL CUTTING: do not use thermal cutting equipment on site unless agreed otherwise for specific applications.

SITE WELDING: where site welding is required, provide suitable staging, platforms and weather protection for welding operations with all safety precautions.

GROUTING

GROUTING. Do not carry grouting until the steel beam has been aligned and properly connected at its ends.

SPACE: immediately before grouting, the space is to be clean and free of all extraneous matter.

PROPRIETARY GROUT: prepare, mix and place in accordance with the manufacturer's recommendations.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
110 of
225

QUALITY CONTROL TEST CERTIFICATES

STEELS: provide mill or test certificates to demonstrate that steels used in the work conform with this specification. Mill certificates shall be provided for each batch of steel materials delivered to the site.

BOLTS: provide test certificates to demonstrate that bolts used in the Work conform with this specification. Test certificates shall be provided for each batch of bolts and nuts materials delivered to site.

SCOPE OF WELD EXAMINATION

BUTT WELDS: subject to the following non-destructive examinations.

Visual inspection to BS 5289

Penetrant test BS 6443 or magnetic particle test to BS 6072.

Ultrasonic examination to BS 3923: part 1 or to an equivalent standard.

FILLET WELDS: subject to the following non-destructive examinations:

Visual inspection to BS 5289

Penetrant test BS 6443 or magnetic particle test to BS 6072

Ultrasonic examination to BS 3923: Part 1 or to an equivalent standard for welds with a leg length greater than 12mm.

INSPECTING AUTHORITY: examination of welds is to be carried out by the Inspecting Authority.

RECORDS: keep records of all weld examinations.

BOLTED CONNECTIONS: following complete assembly of all bolted connections, check the fit and tightness at least 5% of the bolts at locations to be agreed with the Consultant.

FREQUENCY OF TESTING STEEL MATERIALS

The Contractor shall allow for testing steel materials BS 4360 by an accredited laboratory. Tests shall be carried out prior to commencement of work and prior to change of source of steel plate materials.

SWEDISH STANDARDS

SIS 05 59 00 Pictorial surface preparation standards for painting steel surfaces

STEEL WORK CORROSION PROTECTION SPECIFICATION

GENERAL

Do not treat surfaces to be encased in concrete unless specified. See structural drawings for protective treatments and notes.

DEFINITIONS

DFT: minimum dry film thickness of a paint coating. Minimum local thickness of a sprayed metal or galvanized coating.

HDG GALVANIZING: galvanizing in accordance with BS 729.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
111 of
225

MATERIALS

PROPRIETARY MATERIALS

EVIDENCE OF COMPLIANCE: before commencement of the work, provide evidence to demonstrate that the proposed materials comply with the specification.

MANUFACTURE'S INSTRUCTIONS

MANUFACTURE'S INSTRUCTIONS: obtain from the manufacturer of any proprietary product detailed instructions on the use of the product, specific to the situation found on the Contract.

USE OF PRODUCT: comply with the manufacturer's instructions for the use of any product. If these are in conflict with the requirements.

BRITISH STANDARDS

BS 4	Structural steel section Part 1: specification for hot rolled sections
BS 427	Method for Vickers hardness test Part 1: testing of metals
BS 729	Hot dip galvanised coating on iron and steel articles.
BS 1449	Steel plate, sheet and strip Part 1: specification for carbon and carbon manganese plate, sheet and strip
BS 1706	Electroplated coating of cadmium and zinc on iron and Steel
BS 2853	The design and testing of steel overhead runway beams
BS 2989	Specification for continuously hot-dip zinc coated steel : Wide strip, sheet/plate and slit wide strip.
BS 2994	Specification for cold rolled steel sections.
BS 3382	Electroplated coatings on threaded components Part 1: Cadmium on steel components Part 2: Zinc on steel components
BS 3692	ISO metric precision hexagon bolts, screws and nuts.
BS 3923	Methods for ultrasonic examination of welds. Part 1: Manual examination of fusion welds in ferritic steels
BS 4190	ISO metric black hexagon bolts, screws and nuts
BS 4320	Metal washers for general engineering purposes
BS 4360	Specification for weldable structural steels

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
112 of
225

BS 4395	High strength friction grip bolts and associated nuts and washers for structural engineering. Part 1: General grade. Part 2: Higher grade bolts and nut and general grade washers. Part 3: Higher grade bolts (wasted shank), nuts and general grade washers.
BS 4464	Spring washers for general engineering and automobile purpose(metric series)
BS 4604	The use of high strength friction grip bolts in structural steel work. Metric series. Part 1: General Grade Part 2: Higher Grade (Parallel shank) Part 3: Higher Grade (Wasted shank)
BS 4848	Hot rolled structural steel sections Part 2: Hollow sections Part 4: Equal and Unequal angles
BS 4870	Specification for approval testing of welding procedures. Part 1: Fusion welding of steel
BS 4871	Specification for approval testing of welder working to approved welding procedures. Part 1: Fusion welding of steel.
BS 4921	Standardized coatings on iron and steel articles
BS 4933	ISO metric block cup and countersunk head bolts and screw with hexagon nuts.
BS 5135	Specification for the processor arc welding of carbon and manganese steels.
BS 5289	Code of practice for visual inspection of fusion welded joins. BS 5950Structural use of steel work in building Part 1: Code of practice for design in simple and continuous construction hot rolled sections. Part 2: Specification for materials, fabrication and erection hot rolled sections
BS 5996	Method of ultra sonic testing and specifying quality grades of ferritic steel plate.
BS 6072	Method of magnetic practice flaw detection
BS 6363	Specification for welded cold formed steel structural hollow sections
BS 6443	Method of penetrant flaw detection
BS 6780	Specification for through thickness reduction of area of steel plates and wide flats.

22.1 STRUCTURAL DESIGN FOR CANOPY AND FALSE CEILING.

Charges towards detailed fabrication drawings for structural Canopy including foundation, columns, rafters, trusses, perlins, angles, brassings, cleats, fastners, fals ceiling grid, etc. including bill of materials & specifications for the entire Canopy to be constructed. Entire design & drawings for the above to be duly certified by Chartered Structural Engineer & approval of LIOC to be obtained prior to commencement of work at Site; Rate to be quoted also to include two visits by the Chartered Structural Engineer as below:

1st Visit: Upon completion of fabrication & erection of Canopy Structure including Roofing & before commencement of false ceiling;

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
113 of
225**

2nd Visit: Upon completion of entire Canopy works including false ceiling, erection of under canopy lights etc. & issuing of certificate of completion. This certificate shall be addressed directly to LIOC.

The charges to be quoted includes design and BOM for the foundation of Canopy, structural canopy and false ceiling including obtaining approval of LIOC prior to commencement of works.

- 22.1.1 Structural drawings for canopies up to 200 Sqm.
- 22.1.2 Structural drawings for canopies more than 200 Sqm.

22.2 STRUCTURAL STEEL WORKS FOR CANOPY COLUMNS

Supplying and fabricating (Shop Fabrication to be done as per specifications and approved fabrication drawings), transporting to site & erecting structural steel members for canopy and other works including two coats of zinc phosphate primer and two coats of synthetic enamel paint, provision of necessary erection bolts, nuts, washers, cleats, stiffeners, gussets, base plate and all operations such as, but not limited to, preheating as per specifications, straightening, cutting, drilling, grinding etc. complete. (Weight of erection nuts, bolts & studs shall not be considered for payment).

This item includes the following items of works:

- a. Supplying MS channels, angle irons, RS Joists, Plates, rounds, Pipes and square bars including Nuts, Bolts, Washer, Rivets, Gusset Plates, cleats, etc, confirming to IS 2062 & IOC Specification no. 15.
- b. Bending, cutting, fabricating & welding (electric or Gas Welding) the above steel structurals into shape and size as per drawing or as directed by engineer.
- c. The weight of Nuts, bolts, washers shall not be measured for payment purposes.
- d. Mechanical cleaning and painting:
 - Mechanical cleaning of the surface to SSPC SP 2 using power tool.
 - Painting the structure with 1 coat of Epoxy Zinc Phosphate primer to a DFT of 75 microns; 1 coat of Micaceous Iron Oxide (MIO) paint to a DFT of 125 microns
 - 2 coats of synthetic enamel paint of approved colour and shade to a DFT of 40 microns per coat.

Total painting system thickness shall be 280 microns.

Note: Any civil works required under this item shall be paid separately on actual measurement basis.

22.2.1 Structural Steel Works for Canopy columns & similar structural works

22.3 FOUNDATION BOLTS FOR CANOPIES

Supplying and fixing MS foundation bolts with necessary GI nuts and washers of specified sizes, all conforming to relevant Indian Standards and as approved by Engineer-in-charge:

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
114 of
225**

The item includes supply of bolts with nuts and washers of approved quality, threading to required length and fabricating the foundation bolts to specific lengths & plate welded to bottom using MS structural conforming to IS 2062 & grouting the same in foundations.

22.3.1 1000 mm long anchor bolts

22.4 STRUCTURAL STEEL WORK FOR CANOPY ROOF STRUCTURE

Supply, fabrication, cutting, welding, erection of MS structural steel works comprising of beams/ channels/ angles/lip channels/ rods/ rafters/ plates/ gussets etc as per approved drawings for Canopy & fascia framework for petrol sheds including mechanical cleaning of surface of structurals using power tool;

This item includes the following items of works:

- a. Supplying MS channels, angle irons, RS Joists, Plates, rounds, Pipes and square bars including Nuts, Bolts, Washer, Rivets, Gusset Plates, cleats, etc, confirming to IS 2062 & IOC Specification no. 15.
- b. Bending, cutting, fabricating & welding (electric or Gas Welding) the above steel structurals into shape and size as per drawing or as directed by engineer.
- c. The weight of Nuts, bolts, washers shall not be measured for payment purposes.
- e. Mechanical cleaning and painting:
 - Mechanical cleaning of the surface to SSPC SP 2 using power tool.
 - Painting the structure with 1 coat of Epoxy Zinc Phosphate primer to a DFT of 75 microns; 1 coat of Micacious Iron Oxide (MIO) paint to a DFT of 125 microns
 - 2 coats of synthetic enamel paint of approved colour and shade to a DFT of 40 microns per coat.

Total painting system thickness shall be 280 microns.

For measurement purpose, the roof ceiling plan area from edge to edge shall be considered for payment.

22.4.1 Structural Steel Works at Canopy Roof structure

22.4.2 Structural steel works for Fascia for Canopy

22.4 STEEL WORK FOR ROOFING OF CANOPIES

Supplying and fixing ZINCALUME colour bond metal roof profile (0.47mm thick TCT) in single length fixed to "C" purling with roofing bolts. Colour to be approved by the Consultant/Engineer.

PROVIDING & FIXING HI RIB COLOURED ZINCALUME ROOFING: Providing and fixing High Rib coloured Galvalume / Zincalume 0.47 mm TCT or equivalent steel roofing system of approved make as per standard specifications & manufacturer's instructions, etc. complete as directed by LANKA IOC PLC

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
115 of
225

Material:		
Cold rolled steel	-	Confirming to ASTM: A 446 having yield stress of 550 Mpa.
Base metal thickness	-	0.42 mm
<u>Coating:</u>		
Hot dip metallic coating	-	AZ 150 (Aluminium Zinc alloy comprising 55% aluminium, 43.5% Zinc & 1.5% Silicon) as per ASTM A 792. (Coating on both sides)
Coating mass	-	150gms/sq.m (total of both sides) as determined by triple spot tests.
Finishing	-	Colour coated Galvalume finish.
Total coated thickness	-	0.47 mm TCT

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
116 of
225

Approximate mass of completed roofing	-	4.24 kg / sqm.
Approximate coverage per tonne of weight.	-	235 sqm
Recommended span	-	For wind loads as per IS: 875. Design wind velocity 50m/s with a cyclic factor of 1.15
Single span	-	900mm (maximum)
End span	-	1200mm (maximum)
Internal span	-	1800mm
Overhang	-	150mm
Available dimensions of roof sheeting:		
Length	-	Upto 12000 mm but lengths more than 6000 mm are subject to transportation limits
Cover depth / width	-	1000 to 1020 mm
Overall width	-	1060 mm
Crest	-	20-30 mm at 225 – 250 mm c/c with 3 stiffening rib in the pans between two crests.
Approximate coverage per tonne of weight.	-	235 sqm
Recommended span	-	For wind loads as per IS: 875. Design wind velocity 50m/s with a cyclic factor of 1.15
Single span	-	900mm (maximum)
End span	-	1200mm (maximum)
Internal span	-	1800mm
Overhang	-	150mm

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
117 of
225

Available dimensions of roof sheeting:		
Length	-	Upto 12000 mm but lengths more than 6000 mm are subject to transportation limits
Cover depth / width	-	1000 to 1020 mm
Overall width	-	1060 mm
Crest	-	20-30 mm at 225 – 250 mm c/c with 3 stiffening rib in the pans between two crests.
<u>Fastening, laying and fixing method:</u>	-	The steel sheets are to be fastened to roof purlins using fasteners to fix sheets which shall be hex head self drilling self tapping zinc coated fasteners of size No. 12-24 x 55 mm, if required drilling of purlins to be done. The fasteners shall pierce through the crest of the sheet, one screw per crest and at side wise overlapping of the sheet, fixing with stitching screws of No. 10-12 x 20 mm at spacing of 500 mm.
<u>Flashing, capping and specials:</u>	-	The flashing, capping and trims shall be manufactured from the same material as the roof sheeting and in standard lengths of 2.5m. These are to be fixed with No.10-12 x 20mm hot dip Zinc coated self tapping screws. The width shall be upto 1000mm as per site requirements. However flashing sheets, ridge & gutter as per site requirement shall be measured & paid separately

MEASUREMENT OF ROOFING:

The measurement shall be taken for the finished work in superficial area on the flat plane of the roof / side measured in square metres correct to two decimals without allowance for laps and corrugations and payment effected based on unit rate.

The laps between the sheets both at the ends and at the sides shall not be measured. However, the overlaps of the sheets over valley gutters, ridge, hip and flashing pieces shall be included in the measurement.

The rate shall also include the cost of all materials and labour involved in all the operations described in the specifications and as may be necessary for the work. The rate quoted shall also include any staging or any temporary structure required for the purpose of installing the roof.

RIDGES SUITABLE FOR HIGH RIB GALVALUME / ZINCALUME SHEETS AS PER ITEM Nos. 22.4:

Providing and fixing ridges suitable for High Rib coloured Galvalume / Zincalume roofing system 500 mm wide 0.47 mm TCT equivalent of approved make as per standard specifications & manufacturers instructions, etc. complete as directed by LIOC.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
118 of
225

Material:-

Cold rolled steel	-	Confirming to ASTM:A446 having Yield Stress of 275 MPa
Base Metal thickness	-	0.42 mm
<i>Coating</i>		
Same as coloured Hi Rib roofing sheet		
<i>Finishing</i>		
Colour coated Galvalume finish		

Laying and Fixing

Ridges are to be fixed using self drilling self tapping screws as per manufacturer's specification.

Measurement of ridges shall not be paid separately & finished area of roof will be taken for payment of roofing include with ridges.

22.5.1 Supplying and Laying ZINCALUME sheet for roofing including ridges

22.5.2 Supply & fixing of ZINCALUME 450 mm wide flashing

22.5.3 Sup & ins of ZINCALUME 600mm wide flashing

22.6 GUTTERS FOR ROOF OF CANOPY

Supplying and fixing 900 mm wide x 150 mm high to 200mm percolated Zincalume sheet steel (0.47 mm TCT) gutters fixed with recommended fasteners and mild steel 25 x 5 mm flat as per the detailed drawing No. LIOC/ENG/STD/15. Rate to include suitable nozzles to connect 110 mm dia PVC down pipes. Rate to be quoted also to include sealing of the joints of the gutter with necessary silicone sealant for water tightness & self drilling self tapping screws as per manufacturer's specification.

22.6.1 Supplying and fixing of percolated Zincalume gutters 1

22.7 STEEL WORK - SUSPENDED FALSE CEILING FOR CANOPIES

Supply and installation of false ceiling system of approved make as per vendor list comprising of 150 mm wide panels (including filler strips, if any) formed out of pre-coated, weather resistant and petroleum fumes resistant steel panels coated in white including the cost of suitable carriers, hardware and false ceiling suspension arrangement. The direction of the panel should be perpendicular to the road. The manufacturer's specifications should be made available to the Site Engineer and the work should be executed strictly as per manufacturer's specification.

Material:

Cold rolled steel	-	Confirming IS: 513 having yield stress of 240 Mpa.
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SIGNATURE OF TENDERER
SEAL

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
119 of
225**

Base metal thickness	-	For ceiling panels : 0.47mm For carriers : 0.55mm
<u>Coating:</u>		
Hot dip metallic coating	-	120 gms / sq.m Zinc coating (galvanizing) as per IS: 277 on both sides.
Coating mass	-	150gms/sq.m (total of both sides) as determined by triple spot tests.
Organic coating	-	Organic coating with modified polyester paint on a continuous coil coating line.
		Top side - 20 micron modified polyester paint over 5 micron epoxy primer.
		Back side - Alkyd back coat
Total coated thickness	-	For ceiling panels : 0.50mm For carriers : 0.60mm
Approximate mass of completed Ceiling	-	4.95Kgs./sq.m
Recommended spans	-	For carriers : 1200mm C/C For suspenders : 1200mm C/C
Available dimensions	-	For ceiling panels : 150mm wide / 200mm wide x 17mm deep with tongue & groove interlocking arrangement.
		For carriers: 34.5mm wide x 48mm deep.
Length	-	For ceiling panels : upto 6000mm For carriers : upto 5000mm

MEASUREMENTS FOR FALSE CEILING:

The superficial area of false ceiling (reflected ceiling plan measured) shall be measured in square metres correct to two decimals and paid at the unit rate less deductions, if any. Openings in false ceiling which are less than 0.2 sq.m in area shall not be deducted for the purpose of payment. The rate for false ceiling shall include supply, delivery and erection of all materials for covering the ceiling, frame work, suspenders or hangers, carriers, levelling and painting including preparing detailed false ceiling drawings. No extra payment shall be made for modifications that may be required at site.

22.7.1 ZINCALUME colour bonded Suspended False Ceiling with framework**22.8 PROVIDING GYPSUM BOARD FALSE CEILING**

Providing Gypsum board false ceiling of 12.5 mm thick tapered edge gypsum board using standard GI sections including scaffolding, labour, making necessary cutouts, sundries etc. complete as per standard specifications and as directed by LANKA IOC PLC.

Providing and fixing suspended false ceiling, at all levels which include providing and fixing G.I perimeter channels of size 0.55 mm thick with unequal flanges of 20mm and 30mm and a web of 27 mm along the perimeter of ceiling, screw fixed to brick wall/RCC partitions with the help of nylon sleeves and screws, at 230 mm centres. Then suspending G.I. Intermediate channels of size 45x15 mm, 0.9 mm thick from the structural roof members as per drawing at 1220 mm centres (maximum) with ceiling angle of 25mm x 10mm x 0.55 bolted to structural roof

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
120 of
225**

members with suitable arrangement for proper fastening. Ceiling section of 0.55 mm thickness having knurled web of 51.5 mm and two flanges of 26 mm each with lips of 10.5 mm are then fixed to the intermediate channel with the help of connecting clips and in direction perpendicular to the intermediate channel at 457 mm centres. 12.5 mm tapered edge Gypsum board (conforming to IS-2095-1982) is then screw fixed to ceiling section with 25mm drywall screws at 230 mm centres. Screw fixing is done mechanically either with screw driver or drilling machine with suitable attachment. The boards shall be jointed and finished to a flush finish of tapered and square edges of gypsum board (including providing V grooves in cut tiles wherever necessary) with recommended filler, paper tapes, control joints and finished on the bottom side with two coats of approved primer suitable for gypsum board as per manufacturers specifications and two coats of approved quality water sealant on the top surface of gypsum board.

The ceiling shall be provided with recessed portions/coffers as per drawing if necessary. Nothing extra shall be paid for providing specified number of recesses at different levels, and the vertical/slanting portion between different levels shall also be provided with 12.5mm gypsum board panels fixed by means of 25x10x0.55mm GI angle sections and ceiling sections as specified.

The rate shall include cost, lead, lift of all materials, labour, scaffolding charges, primer etc. complete as per drawings specifications and direction of Engineer-in-charge.

The rate shall also include the cost of making openings of any shape for light fittings, grills, diffusers, cut-outs etc. made with frame of perimeter channels as per drawing and finishing the edges as directed by Engineer-in-charge.

The measurement shall be taken along the girth on the bottom side of the ceilings, in square metres and deductions shall be made for all openings exceeding 0.4sqm in area.

22.8.1 Gypsum board false ceiling with supporting suspension framework

22.9 STEEL WORK (CHEQUERED PLATES)

Supplying, laying 6 mm thick MS chequered plate in position including necessary cutting, painting in 2 coats of red oxide primer and two coats of black colour synthetic enamel paint on both sides.

22.9.1 6mm thick MS chequered plate

22.9 STEEL WORK (PUMP GUARDS/ FIRE BUCKETS)

MS BARRICADING FOR PUMP ISLANDS(PUMP GUARDS):

Supply, fabrication & fixing of stainless steel tubes for barricading of pump islands as per enclosed specifications & drawings.

Providing, fabricating and fixing stainless steel dumbbell protection guard made out of stainless steel pipes 40 mm dia verticals (5 nos. per dumbbell of dia 1200 mm) with 2 rows of 25 mm pipe welded to the vertical pipes as shown in the drawing, including SS balls fixed on

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
121 of
225**

the top of the vertical pipes and SS caps at the bottom of the pipe and below the SS ball. The rate shall include cost of necessary welding, grinding, buffing and polishing the joints, grouting the railing, cost and conveyance of all materials, labour charges, wastage, sundries etc. complete.

Measurement shall be taken for finished rails in running meters.

22.10.1 Supplying & Fixing Pump Guards as per drawings No. LIOC/ENG/STD/16

FIRE BUCKETS

Supply of Fire buckets (9 litre capacity) painted white inside and red outside with letters 'fire' in black

22.10.2 Supply of Fire buckets (9 lt capacity) painted in red & letters in black

22.10 STEEL WORK (HOARDINGS)

Supply, fabrication & erection of single sided hoarding board manufactured as per approved drawing using MS structural frames all round for fixing flex hoarding including all the civil works for foundation, etc

Supply, fabrication & erection of hoarding board manufactured as per standard drawing using 65 x 65 x 6mm MS angle frame all round, with one horizontal bracing using 50 x 50 x 6mm MS angles fixed at centre and vertical bracings of MS angle 50 x 50 x 6mm as shown in the drawing. The item includes supports using ISMB sections, etc. as per the approved drawings and instructions of LIOC.

All the civil works for foundation, including earthwork, PCC 1:4:8, RCC foundation if any, reinforcement, foundation bolts etc. will be measured and paid separately.

22.11.1 (45 ft X 15 ft) Hoarding as per drawing No. LIOC/ENG/STD/17

22.11.2 (30 ft X 10 ft) Hoarding as per drawing No. LIOC/ENG/STD/18

22.11.3 (20 ft X 08 ft) Hoarding as per drawing No. LIOC/ENG/STD/19

23.0 PUMP ISLAND

23.1 PUMP ISLAND (WITH GRANITE WORK)

Construction of Pump pedestal as per enclosed drawing (with GRANITE work), including excavation, foundation concrete (CC 1:2:4), brick work in CM 1:5, plastering in 16 mm, CM 1:4, foundation bolts (M10), concrete for foundation bolts, finished with jet black granite, etc , complete as per drawings.

Note: The granite works includes necessary edge rounding (half round) including polishing etc complete.

23.1.1 900mm x 5000 mm Pump Island as per drawing No. LIOC/ENG/STD/20

23.1.2 900mm x 2500 mm Pump Island as per drawing No. LIOC/ENG/STD/21

23.1.3 900mm x 2500 mm Pump Island as per drawing No. LIOC/ENG/STD/22

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
122 of
225**

23.2 PUMP ISLAND (WITHOUT GRANITE WORK)

Construction of Pump pedestal as per enclosed drawing, including excavation, foundation concrete (CC 1:2:4), brick work in CM 1:5, plastering in 16 mm, CM 1:4, foundation bolts (M10), concrete for foundation bolts, finished with plastering in 16 mm thk & Finishes surfaces with cement rendering, etc , complete as per drawings.

23.2.1 900mm x 5000 mm Pump Island as per drawing No. LIOC/ENG/STD/20

23.2.2 900mm x 2500 mm Pump Island as per drawing No. LIOC/ENG/STD/21

23.2.3 900mm x 2500 mm Pump Island as per drawing No. LIOC/ENG/STD/22

24.0 MANHOLES

24.1 TANK MANHOLES

Item includes excavation, brickwork, PCC, plastering, RCC top slab inclusive of reinforcement as per drawing. Items for Providing MS Cover instead of RCC cover include the following items of work:

- a. Supply, welding & fixing ISA 65X65X6 allround frame
- b. Supply, welding & providing 16 mm Square rod allround
- c. Supply & providing 16 mm thick MS cover plate with necessary lifting arrangement

24.1.1 Brick manhole chamber (Internal size-1000x1000x750 mm)

24.1.2 Brick manhole chamber (Internal size-750x750x750 mm)

24.2 BRICK MANHOLES (ELECTRICAL)

Item includes excavation, brickwork, PCC, plastering, RCC top slab inclusive of reinforcement as per drawing. Items for Providing RCC cover include the following items of work:

- a. Form work
- b. Reinforcement net 10 mm tor steel bars at 150mm intervals both ways
- c. G 25 Concrete slab 150 mm thick

24.2.1 Electrical chamber inner dimensions 600 x 600 mm

24.2.2 Electrical chamber inner dimensions 450 x 450 mm

24.3 BRICK MANHOLES (STORM WATER)

Item includes excavation, brickwork, PCC, plastering, RCC top slab inclusive of reinforcement as per drawing. Items for Providing MS Cover instead of RCC cover include the following items of work:

- a. Supply, welding & fixing ISA 65X65X6 allround frame
- b. Supply, welding & providing 10 mm Square rod allround
- c. Supply & providing 10 mm thick MS cover plate with necessary lifting arrangement

24.3.1 Storm water catch pit internal 600 mm x 600 mm size

24.3.2 Storm water catch pit internal 450 mm x 450 mm size

24.4 GROUND WATER SUMP

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
123 of
225**

Construction of Ground water sump including of earth work, PCC, brick work, RCC manhole frame and all finishing works as per drawing No. LIOC/ENG/STD/27.

24.4.1 4000 Ltr capacity ground water sump

25.0 PRECAST ITEMS

- i) The concrete work also includes cost of shuttering & centering, pre casting the members, leading to the site of work, fixing in position, jointing with cement mortar etc.
- ii) Concrete shall be mixed in mechanical batch type concrete mixers. No hand mixing is permitted. Concrete shall be thoroughly compacted with the help of mechanical vibrators only.
- iii) The cement as specified in the item shall be used for RCC work in specified ratio.

25.1 PRECAST HUME PIPES

The item includes excavation in all types of soils upto a depth of 3.0 meters and laying of base concrete 1:3:6 mix of 150mm thick for pipes above 300 mm dia and PCC 1:3:6 for haunches on sides (haunches depth 100 mm) for all diameter of pipes. In case of two or more adjacent pipes, the gap between the pipes shall be filled with CC 1:3:6 upto 100mm depth. Back filling shall be done using sand and the same has to be consolidated by watering profusely. The excavated earth shall be moved to an unobjected place or as instructed by the Site In charge irrespective of lead involved. The top of Hume pipe shall be normally kept 1500mm below the driveway however the same may vary due to different site conditions in such case direction of engineer shall be final. This specification applies to all sub-items of this item. The scope of work includes hauling and laying of NP2 class RCC Hume pipes of specified diameter, laid in position carefully and jointing with Cement Mortar 1:2 using yarn and respective collars and curing, backfilling with sand etc. including all labour, material etc. complete.

Measurement for earthwork for laying the pipes is included in the item. PCC 1:3:6 and sand filling for laying the pipes will be measured and paid separately under respective items.

25.1.1 225mm dia. - RCC hume pipe Class NP2

25.1.2 300 mm dia. - RCC hume pipe Class NP2

25.1.3 450 mm dia. - RCC hume pipe Class NP2

25.1.4 600 mm dia. - RCC hume pipe Class NP2

25.2 PRECAST KERB

Providing & Fixing pre-cast concrete kerbing blocks of specified shape in CC 1:2:4 with chamfers and recessed edges as per drawings including fixing them in position with C.M. 1:3, after excavating required depth from the ground and consolidating the base, providing PCC1:3:6 including necessary earthwork, PCC 1:3:6, plastering, etc., complete as per standard drawings and manufacturers specs. Sample of blocks shall be approved by Site engineer before procurement from approved sources.

25.2.1 Precast curb (100 mm thk x 300 mm high x 1000 mm long)

25.2.2 Precast curbing (125 mm thk x 300 mm high x 1000 mm long)

**SIGNATURE OF TENDERER
SEAL**

**25.3 PRECAST SEPTIC TANK & SOKAGE PIT**

Supply & installation of cylindrical precast septic tank & cylindrical precast soakage pit including necessary inspection chambers with C.I. manhole cover shall be of heavy-duty type of 600x 600 mm, 250 kg and as per IS standards and installation of 110mm dia. PVC vent cowl (3 m long) & Soil Water Pipe connections.

Item also include supply and laying of 150mm dia PVC pipe (6 kg/cm²) between soak pit and septic tank, excavation and back filling, all civil works etc., complete in all respect. The contractor has to give soak pit and septic tank as per drawing complete in all respect and no extra payment shall be made on any account.

25.3.1 Precast 2500 ltr capacity septic tank

25.3.2 Precast 2000 ltr capacity soakage pit

25.3.3 110mm dia. vent cowl (3 m long)

26.0 DRIVE WAY**26.1 INTER LOCKING PAVERS (SUPPLY & LAYING)**

Providing and laying Pre-cast cement concrete Interlocking Paving block driveway including supplying 80mm thick pre-cast machine made cement concrete Paving block of approved size, shape, shade and manufacturers and as per BS specifications. The paver blocks shall have peripheral chamfer, with average crushing strength not less than 40 N/Sq.mm as per BS6717 Part -1(1986), maximum water absorption of 2% after 10 minutes and 5% after 24 hrs. as per BS 1881, maximum dimensional deviations of +/- 2mm on length & width and +/- 3mm on thickness. The job includes supplying & laying a layer of 50mm thick clean course sand on thoroughly compacted sub-base below the paver blocks, cutting the paver blocks wherever required with hydraulic splitter, filling in the joints at the edges of paver blocks with sand, compacting with machine vibrator to required line and level, etc. complete. (Payment for provision of edge restraints shall be made separately)

i) Scope

This specifications covers general requirements of supply and laying of interlocking pave blocks, including assessment of sub-grade, preparation of sub-base underneath.

ii) Materials

a) Paver blocks

The paver block shall have the following properties.

b) Physical Properties

Thickness - 80 mm with tolerance of ± 3 mm.

Shape - Irregular or Uni type that key into each other and by their plan geometry interlock and resist the relative movement of joints parallel to both the longitudinal and transverse axes of the unit. Unregular shape or equivalent.

SIGNATURE OF TENDERER
SEAL

Laying pattern - Herringbone bond only.

Crushing strength - Average tested as per BS 6717 part 1-1993 shall not be less than 44 N/mm² including of any individual block shall be not less than 40 N/mm²

TABLE – 1

Tolerance of Surface level	
Layer	Maximum permissible deviation from the design level
Sub layer base sand cushion	0 to -12
Paver	+6 to -6

iii) Construction of pavement

Sub Grade, Sub-Base And Base

Prepare the sub grade and sub-base and base so that

- a) The surface levels are within the tolerances given table 1
- b) The longitudinal falls and crossfalls are such that no depression holds water.
- c) The extent of site prepared for block laying includes enough room to provide adequate foundations and backing for any edge restraint.

iv) Edge restrain beam / concrete block

Edge restrains shall be formed before compacting blocks. Do not vibrate the paver until the edge beam together with any concrete haunching has gained sufficient strength.

v) Laying course / river sand bedding course

a) Material :

The sand used for laying the paver blocks shall be natural sand graded in accordance with Table 2.

b) Moisture content :

The moisture content of the bedding course should be as uniform as possible and without being saturated.

c) Screening:

The laying course thickness after final compaction should be 50 mm with a tolerance of +15 and -20 mm. The material shall be spread in one layer, compacted using a plate vibrator making allowances for the reduction in thickness achieved during compaction; and surface leveled by screening.

vi) Laying paver

Paving units should be placed on the prepared laying course so that the surface levels are within the tolerance.



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
126 of
225**

The laying pattern shall be herringbone pattern and checked with a string line. The first row of paving units should be aligned against a straight section of the edge restraint. Paving units should be laid with a joint width typically within the range of 2 mm to 5 mm.

The paved area should be covered with full sized paving units, where paving units need to be trimmed sizes smaller than a quarter of the original size of the unit should be avoided. Trimming has to be carried by machine cut by hydraulic splitter to retain the perpendicular edges.

Fully compact the paver using a plate compactor with a plate area of not less than 0.25 m² transmitting an effective force not less than 75 KN/m² of plate at a frequency of vibration in the range 75 Hz to 100 Hz.

After compaction of the paver, spread sand of the grading in Table 2 as joint filling. The paver shall be again vibrated to ensure complete filling of the block to block joint by the surface applied sand preferably dry.

SIGNATURE OF TENDERER
SEAL

TABLE 2

Sieve size	% passing	
	Grading for bedding material	Grading for joint-filling material
9.52	100	-
4.75	95 - 100	-
2.36	80 - 100	100
1.18	50 - 85	90 - 100
600 micron	25 - 60	60 - 90
300 micron	10 - 30	30 - 60
150 micron	5 - 15	15 - 30
25 micron	0 - 10	- 10

vii) Measurement

The measurement shall be done on the area covered in sq.m corrected upto two decimals. The rate shall be inclusive of preparation of surface, sand cushion, paver blocks laying and compacting complete.

26.1.1 Supply & laying of inter locking pavers (Natural Colour)

26.1.2 Supply & laying of inter locking pavers (Colour)

26.2 DRIVE WAY (GRAVEL FILLING)

Stripping of Top Soil;

Where the existing ground surface is covered with vegetation topsoil or other unsuitable material, it shall be removed together with roots, rubbish or objectionable materials etc. Vegetation or other unsuitable material so removed shall be disposed within 5.0 Km of the site in accordance with environment standards.

Borrow Material

Borrow material shall comply with the following specifications:

- It shall be tested for its suitability by a recognized testing organisation acceptable to the Engineer. It shall be well-graded soil mixture with; gravel and sand – not less than 70%; silt and clay – not more than 30%.
- The Contractor shall forward from each borrow pit a different levels, the test results of particle size distribution and proctor compaction tests by a recognized testing organisation to the Engineer for approval.
- It shall be free of vegetation, roots and such other deleterious material.
- Maximum dry density at optimum moisture content (Standard Proctor Density) shall not be less than 1.6 gm/cm³.
- Maximum size of particles shall not exceed 120 mm.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
128 of
225**

Placing of Fill Material

The distribution and gradation of the material throughout the fill shall be carried out as directed by the Engineer, so as to ensure that the fill will be free from lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. The borrow excavation and placing operation shall be such that the materials when compacted will blend sufficiently to secure the best practicable degree of compaction and stability. Successive loads of material shall be dumped and spread so as to produce the best practicable distribution of material and for this purpose the Engineer may designate the locations in the fill areas where individual loads shall be deposited.

The fill material shall be placed in layers not exceeding 225 mm thickness in loose state.

The fill shall be compacted at each lift to not less than 90% of the Dry Density for the building area and not less than 95% of the Dry Density for Driveway and roads. The method of compaction shall be approved by the Engineer.

Moisture Control

The moisture content of the fill material prior to and during compaction shall be maintained and distributed uniformly through each layer. The allowable placement moisture content will be determined by the Contractor on Engineer's approval so that fill placement can be made under optimum moisture content of the fill material

Density Control

To determine the dry density requirements of the compacted fill, field and laboratory tests shall be made on samples of compacted material taken per layer of compaction for every 500 Sqm.

Method of Measurement

The quantity of fill material shall be determined by taking initial and final level using dumpy level or any other leveling instrument and divided into grids of suitable dimension. The quantities shall be determined using Simpson's rule and trapezoidal rule. All such quantities shall be added to determine the total quantity. Interim payments shall be made on quantities estimated by the Engineer.

General Construction Methods

The Engineer shall have complete control over the excavation, moving, filling and disposition of all material and shall determine the suitability of material to be placed in fill areas. All material determined unsuitable shall be placed in spoil area and or removed from site as directed by the Engineer.

The Contractor shall inform and satisfy as to the character, quality and distribution of all materials to be excavated filled, spoiled and borrowed.

**SIGNATURE OF TENDERER
SEAL**

Should the Contractor through negligence or other fault excavate or fill beyond the designated lines, he shall replace/remove such excavation/fill in an approved manner and conditioned at his own expense.

PROVIDING GRANULAR SUB-BASE

Providing Granular sub-base for the specified depth in layers of 200mm thick, using well graded gravel or natural sand & gravel / crushed stone mix as per IS sieve designation 26.5mm to 0.075mm with minimum CBR value of 20%. The material passing 425 microns sieve to be tested according to IS:2720 (Part V) shall have liquid limit and plasticity index not more than 25% and 6% respectively. The granular sub base to be compacted to 95% of the maximum dry density with 8-10 ton road roller.

SIZE AND GRADING REQUIREMENTS OF COARSE AGGREGATES FOR WBM

IS Sieve Designation	Percent by weight passing the IS sieve
26.5 mm	100
9.5 mm	65-95
4.75 mm	50-80
2.36 mm	40-65
0.425 mm	20-35
0.075 mm	3-10
CBR Value (Minimum) 20%	

26.2.1 Gravel filling in driveway

26.3 DRIVE WAY (SAND FILLING)

The sand used for Driveway filling shall be natural sand graded in accordance with Table 2.

Sieve size	% passing	
	Grading for bedding material	Grading for joint-filling material
9.52	100	-
4.75	95 - 100	-
2.36	80 - 100	100
1.18	50 - 85	90 - 100
600 micron	25 - 60	60 - 90
300 micron	10 - 30	30 - 60
150 micron	5 - 15	15 - 30
25 micron	0 - 10	- 10

26.3.1 Sand filling in driveway

26.4 DRIVE WAY (ABC METAL FILLING)

Aggregate Base Course (ABC)

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
130 of
225

The aggregate base shall be of compacted thickness 225mm and shall consist of graded crushed stone aggregate. The gradation of the aggregate shall conform to limits indicated below in the Table 1. The toughness of the aggregate shall be such that its Aggregate Impact Value (AIV) is not more than 35%.

Sieve Size mm μ m	Percentage Passing by Weight
50	100
37.5	95 – 100
20	60 – 80
10	40 – 60
5	25 – 40
2.36	15 – 30
600	8 – 25
7	5 - 10

In the base course (ABC), the compaction shall be carried out using an 8 – 10 T roller or a heavier roller to obtain 100 % of maximum dry density of the material.

26.4.1 ABC metal filing in driveway

26.5 DRIVE WAY (ASPHALT CONCRETE)

ASPHALT PAVING FOR ROADS & LOADING AREA.

Initially the existing ground must be excavated and formed to line and level by cutting suitably and compacting same with at least 5 passes of an 8 – 10 tons steel wheel roller. While compacting fresh material is added to maintained required levels.

The recommended pavement structure will consist of a selected soil sub base on Aggregates base and a surfacing (Asphalting), constructed over the compacted sub grade as depicted in fig. 1 below.

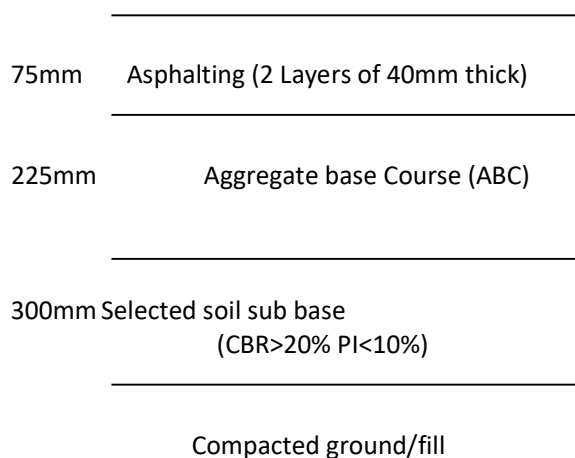


Fig.1

Selected Soil Sub base

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
131 of
225**

The Sub base shall be of compacted thickness 150mm and shall consist of a selected soil of CBR>20% and PI<10%.

Aggregate Base

The aggregate base shall be of compacted thickness 225mm and shall consist of graded crushed stone aggregate. The gradation of the aggregate shall conform to limits indicated below in the Table 1. The toughness of the aggregate shall be such that its Aggregate Impact Value (AIV) is not more than 35%.

Sieve Size mm μ m	Percentage Passing by Weight
50	100
37.5	95 – 100
20	60 – 80
10	40 – 60
5	25 – 40
2.36	15 – 30
600	8 – 25
7	5 - 10

In both the sub base and the base, the compaction shall be carried out using an 8 – 10 T roller or a heavier roller to obtain 100 % of maximum dry density of the material.

PREMIX CARPET OTHER THAN HOT MIX PLANT PREMIX & USE OF MECHANICAL PAVER

Supplying and laying of stone aggregate to a thickness of 75mm to be laid in two layers of 40mm thick with 10mm size metal and shall be mixed with bituminous binder (Grade 80/100) at 56 Kg/Cum Spreading with tack coat and shall be compacted by 8 -10 tones road roller immediately after spreading premix etc. complete.

26.5.1 Asphalt concreting in driveway to a thickness of 75mm.

27.0 FENCING

27.1 P & F CHAIN LINK FENCING WITH MS TUBES

Providing and fixing chain link fencing, using 10SWG GI wire 50mm square mesh fixed with 25 mm square MS tube of 16 gauge with vertical post of 50 mm x 50 mm with necessary nuts, bolts, washers and other fixtures required, painting two coats of zinc phosphate primer and two coats of aluminium paint etc. complete as per drawing No. LIOC/ENG/STD/28 and specifications. (The rate for civil works like excavation, brick masonry, PCC etc. shall be paid separately).

- i) Providing chain link using 10SWG GI strong wire 50mm square mesh woven fixed with 25mm square tube of 16 gauge with vertical posts of 50mmx50mm x16 gauge square tube.
- i) Painting with 2 coats of zinc phosphate primer and two coats of synthetic enamel paint.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
132 of
225**

- ii) All civil works if any will be paid under respective Item rate.

27.1.1 1200MM High Chain link fencing

28.0 TUBE WELL

28.1 TUBE WELL (BORE WELL WITH PUMP)

Rate shall include for following scope of work

- (i) Identifying the point for drilling the tube well.
- (ii) Drilling 165mm-180mm dia. Bore well up to a depth of 30 RM inclusive of all works necessary for commissioning.
- (iii) Supplying and fixing high density polymer water pipe of 25mm dia. for bore well up to a depth of 30 RM & additional 10RM for OH Tank.
- (iv) Providing 165mm dia. PVC casing pipe in bore well and drilling up to 200 mm dia. borehole for fixing the pipe to a required depth.
- (v) Providing, fitting and commissioning up to 20 stage 1.5 HP submersible pump of approved make (Jinasena) with all accessories.

Supplying and laying of copper flat type cable (3Core 2.5 Sqmm Copper Flat Cable for submersible Pump)

A relevant capacity of 3 core submersible flat type copper cable from submersible pump to motor starter shall be provided. Waterproof jointing material shall be used for cable jointing between motor and starter cable under the water surface.

28.1.1 Bore well, including all the above scope of work complete.

29.0 LANDSCAPING

29.1 Turfing the area with Buffalo grass.

Surface preparation, turfing the area with Buffalo grass in sheet form, adding manure and all works as per detailed specification.

Providing, planting and turfing with Buffalo grass pods in specified areas after bed preparation including forming mounts and profiles with available red earth, providing and mixing necessary manure and river sand, watering, etc. complete. The rate shall include periodical maintenance of the turfing including cutting, de-weeding, applying manure etc. during the defects liability period of the work. Measurement shall be taken for actual measurement of grass planted covering mounts and profiles.

29.1.1 Surface preparation, turfing with Buffalo grass.

29.2 Planting of Trees

Providing, planting of trees in specified areas after excavation of pits including preparation of suitable media with available red earth, providing and mixing necessary manure and river sand, watering, etc. complete. The rate shall include periodical maintenance of the Trees including watering, de-weeding, applying manure etc. during the defects liability period of the work.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
133 of
225**

Item includes excavation of pit (1'6"x1'6"), preparation of suitable media (compost + top soil= approximately 3kg) ,planting, maintenance with watering and de-weeding as directed and adding manure and all works as per detailed specification.

29.2.1Bamboo plants (bush with average 4 nos of trees above 7' Height)

29.2.2 Red Palm (bush with average 4 nos of trees above 8'-10' Height)

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
134 of
225**

MECHANICAL SPECIFICATIONS

PARTICULAR SPECIFICATIONS

The particular specification (MECH) shall be read in conjunction with the General Specification where applicable. Where the particular specification is in conflict with the General Specification, the Particular Specification shall prevail.

All the British codes referred in the general specification shall conform to the latest relevant British standards.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
135 of
225**

**DETAILED ITEMWISE DESCRIPTION FOR MECHANICAL WORKS (WRT. ITEM CODE GIVEN IN THE PRICE
SCHEDULE)**

PARTICULAR SPECIFICATION FOR MECHANICAL INSTALLATION.

STANDARDS

The Equipments, accessories, material, installation testing and commissioning shall be done in accordance with following norms and standards,

- a. Srilanka standards.
- b. The British standard specification and codes of practice.
- c. Indian standards
- d. American standards.

Tenders may offer materials in accordance with such other standard or specifications, which provide for quality and workmanship not inferior to the standards together with additional clauses or amendments setout in these specifications. Such standards or specifications shall be submitted in full at the time of tendering. Authenticated English translation shall be submitted if the specifications are in other languages.

When reference is made within these documents to certain standards, specifications or regulations, the reference shall be constructed to mean the standard with all subsequent amendments and changes or additions as thereafter adopted and published that are in effect at the date fixed for receipt of tenders.

Tenderers are instructed that any clarifications and/or additional information etc. pertaining to the scope of work should be obtained fully before tender submission and that the quality and quantum of work which should be as per the above standards properly understood since no extra works would be permitted due to any subsequent clarification of lack of information.

SPECIFICATIONS FOR TANK INSTALLATION WORKS

- i. **EXCAVATION:**
 - a. Excavation shall be carried out as per detailed specifications for the same under civil items.
 - b. Setting out shall be done before excavation. Excavation to be carried out to precise locations & levels. Any extra or over excavation shall not be paid for and shall be rectified by the contractor at his own cost.
 - c. Consolidation to the final surface shall be done with hand rammers/rollers including watering.
- ii. **SOIL CLASSIFICATION:**
 - a. Excavation for tank pit shall be carried out in all types of soils including soft rock but excluding hard rock requiring blasting/chiseling. If hard rock is encountered during excavation, this shall be measured separately and paid as per relevant item in the schedule. The corresponding quantity shall be deducted from the total amount as per the rate for soft soil in the schedule.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
136 of
225**

iii.BAILING OUT WATER

- a. Wherever sub soil water or any other water exists, water accumulated in the tank pit shall be removed continuously with the help of a suction pump.
- b. The water shall not be allowed to accumulate in tank pit and regularly pumped out until completion of backfilling of tank pit to avoid damage to pit or tank foundations.

iv.SHORING:

- a. Shoring of wooden sleepers or steel plates with sufficient supports shall be provided for restricting falling of earth from side embankment wherever required.

v.TANK FOUNDATIONS:

- a. Sand for filling purposes shall be clean, hard, sharp & free from organic/ vegetable matter/ dirt/lumps/stones etc. It shall be filled/consolidated in 200mm layers
- b. The cement concrete (Screed) for the sub grade shall be of specified ratio, and shall be laid/consolidated as per BS specifications for Plain cement concrete & as per drawings.
- c. The reinforced cement concrete for tank foundation (Base slab) in the prescribed ratio shall be laid as per BS specifications for reinforced cement concrete & as per the drawings. The holding down anchor bolts and general reinforcement shall be provided wherever required as per standard drawings before casting concrete.
- d. Formwork for the purpose of casting tank foundation shall be wooden or steel of specified thickness and size as specified under Item No ZICL100100 for formwork.
- e. Steel reinforcement shall conform to BS 8110(Code for high strength deformed steel bars in concrete reinforcement). Mechanical vibrators shall be used for concrete compaction.

vi. INSPECTION OF TANK:

- a. The CONTRACTOR shall thoroughly examine the tank for any dents etc. at the time of taking over the equipment from the Tank fabricator/Transporter and the same has to be brought to the notice of LIOC engineer before execution of work. If any, dents, puncture, damage etc, has taken place on the equipment during the transportation the same has to be rectified by the transporter at free of cost.
- b. Examination of welds shall be done by visual means.
- c. Check of proper orientation of equipment before burying shall be done in case of the buried tanks.

vii. HANDLING, LOWERING, ALIGNING AND POSITIONING THE TANK IN THE PIT:

- a) The tank is required to be lowered in the pit with mechanical aids, such as crane/chain pulley. The mild steel horizontal tank is lowered in the earth/masonry pit in one of the following procedures:

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
137 of
225**

- a.1 Mechanical Method: The tank is lifted mechanically with the help of a suitable capacity crane and the tank is lowered very carefully/smoothly and made to rest over the tank foundations. Care shall be taken that no damage is done to tank, the foundation and tank pit.
- a.2 Chain Pulley Method: The tank is rolled over the wooden-sleepers very carefully and brought to the edge of tank pit parallel to the foundation. The tank is thereafter lowered in the pit over a temporary earth ramp with the help of chain Pulley arrangement. Care shall be taken while rolling as well as lowering that no damage is done either to tank or foundations.
- b) Each tank is allowed to rest over sand bags (placed over the foundations up-to anchor bolt height) until testing/doping of the tank is completed in all respects. When testing/doping of the tank is completed, the sand is removed from the bags and spread in layers over the foundations as specified and tank is allowed to rest on the foundation.
- c) Finally, the tank has to be aligned using level gauge and positioned so as to maintain correct level, and both the manholes are in one horizontal plane. Then the fixing of hold down bolts supplied shall be completed.
- d) The bottom of the tank which is going to be in contact with the ground has to be doped before lowering of tank. Balance area to be doped only after hydro-testing.

viii. TESTING OF TANKS:

The tank shall be tested hydrostatically to a pressure of 0.50 Kg/Cm² using a calibrated pressure gauge including supply of water, emptying, cleaning the tank. The above pressure shall be maintained for a period of at least 4 hours for thorough examination of all joints to detect any leaks, pressure drop and undue distortion etc. As soon as the testing/checking of leaks is over the pressure is released, the tank shall be thoroughly dried out.

ix. DOPING:

DOPING OF 9/15/22.5 KL TANKS:

The item includes removing the existing doping (in case of existing tank / pipeline) cleaning the surface and carrying out the doping with following 3 coats cold applied anticorrosive treatment after preparing the surface as per manufacturer specifications as directed by the site in-charge.

1. ZINC PHOSPHATE PRIMER to a thickness 170 Microns.
2. Two coats of BITUMEN EMULSION -FLINTKOTE 3 or equivalent for a coverage of 1.5Ltr/m² for two coats.

Surface preparation - Power brush cleaning to SA - 1
Application Method - Roller brush or Airless spray.

x. BACKFILLING:

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
138 of
225

Back-filling operations are most important to the life of installation. Back filling below, around and above Tanks should be of clean, noncorrosive material such as clean washed sand or gravel.

xi.SAFETY:

Excavation work shall be carried out in line with BS Specifications (Code of safety for excavation work). After installation of tank in the pit, the tank shall be kept filled with water till the commissioning of tank to prevent floating of the tank. In case the tank floats due to non compliance of above, the contractor shall redo the installation work as described above at no extra cost to LIOC.

xii. SAND CUSHION (optional)

In clay/black cotton soil a sand cushion up to 1m depth shall be provided below the Tank Base Slab, as directed by Engineer-in-charge. This shall be measured and paid separately under the respective item rate.

1.1 INSTALLATION OF TANKS IN EARTH PIT WITH RCC BASE SLAB & TOP SLAB

- (1) Installation of New/Old tank with or without manhole.
- (2) Detaching all inside/outside fittings from tank.
- (3) Keeping the tank with fittings in safe custody till handing over the installation to Engineer, Consumer or Dealer.
- (4) Shifting of the tank (with fittings) to the place of installation within the site limit.
- (5) Clearing the site of installation from any bushes, vegetation or any other materials lying at site.
- (6) Earthwork excavation is to be done as per drawing, in all types of soils such as ordinary / hard soil, gravel, pebbles, stone boulders big or small, soft rock, mud, peat, asphalted / WBM driveways & with PCC or RCC including all lead and lift. No extra payment shall be made on this account except blasting of hard rock.
- (7) Dressing / leveling & consolidation of the tank pit area.
- (8) Bailing out sub-soil water or any other water, if met with, from tank pit area till completion of the installation of tank.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
139 of
225**

- (9) Shoring shall be done with necessary wooden planks, sleepers or steel Plates as approved by the Engineer-in-charge.
- (10) Spreading clean dry coarse sand under the tank over the entire area of the tank up to a consolidated depth.
- (11) Handling, lowering, aligning and positioning the tank in the pit as specified in the general section above. The tank is required to be lowered in the pit with mechanical aids, such as crane/chain pulley only. No extra payment shall be made on this account.
- (12) Inspection of the tank for dents, inspections of welds, etc. shall be done as specified in the general section above.
- (13) Testing the tank hydrostatically to a pressure of 0.50 Kg/Cm², as specified in the general section above including supply of sweet water, emptying and cleaning the tank. Gasket for manholes should be replaced with new one after hydrostatic testing of tank.
- (14) Cleaning the tank from inside with gunny bags, jute, etc. In case of old tank the contractor will have to remove the dead stock, sludge, and store at a place as directed by the Engineer-in-charge, prior to testing of the tank. The contractor will make the tank gas free as per the approved procedure under the supervision of the Engineer-in-charge, prior to taking up the cleaning/repairs to the tank.
- (15) Scrapping and cleaning the surface and carrying out the doping as detailed in the general section above. In case of old tank, the Contractor will have to scrap the old primer & anticorrosive paint to the satisfaction of the Engineer-in-charge by the methods as approved by him/her, before applying the fresh paint, without any extra cost to the Corporation.
- (16) Fixing, LIOC supplied, inside and outside dip pipes, brass cap, locking arrangement, including fixing/tightening of bushes & flanges.
- (17) Fixing, inside fill pipes, suction pipe including fixing/tightening of bushes and flanges and also fixing outside fill pipe at the decanting point. Supply & fixing of Pipe lines shall be paid separately.
- (18) Fixing of manhole cover plate in position including replacement of 3mm thick CAF, permanite oil gasket conforming specifications, nuts, bolts, washers (approved make), which might have been damaged / missing. Item also includes facing of manhole flange and cover plate to be done before fixing.
- (19) Supplying and filling with the clean dry sand inside the tank pit is to be done and unwanted debris are to be transported beyond municipal limits or unobjectionable place for disposal, as directed by Engineer-in-charge.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
140 of
225**

- (1) Providing and laying R.C.C. 1:1.5:3 (1 cement : 1.5 coarse sand : 3 crushed graded stone metal of 12 to 20mm nominal size) G-25 concrete Tank top & bottom slabs with respective thicknesses complete as per drawing referred above including screed concrete, Gauge 1000 polyurethane sheets, shuttering, centering, curing, supply of M.S./TOR/TMT reinforcement bars including its cutting, bending positioning and binding with 16 gauge of M.S. binding wire (This includes the cost of reinforcement bars and binding wire). Frame for manhole covers are to be embedded in concrete at the time of concreting the tank top slab.
- (20) Assembling, fixing & tightening of LIOC supplied, holding down bolts, turn buckles after RCC base slab are fully set & cured.
- (21) Extra payment shall be made for excavation in hard rock /RCC as per the rate of relevant item in the schedule. However suitable deductions shall be made from the total amount for corresponding quantities based on respective rates.
- (22) Number of suction points shall be indicated as per the requirement at site.
- 1.1.1 Installation of 9 kl UG tank as per drawing No. LIOC/ENG/STD/32.
- 1.1.2 Installation of 15 kl UG tank as per drawing No. LIOC/ENG/STD/33.
- 1.1.3 Installation of 22.5 kl UG tank as per drawing No. LIOC/ENG/STD/34.
- 1.2 INSTALLATION OF TANKS IN MASONRY PIT WITH RCC BASE SLAB & TOP SLAB
- (2) Item Nos. 11.1 (1) to (23) are also applicable.
- (3) Providing and laying base cement concrete (as per drawing referred above) along the periphery of the tank pit including shuttering, ramming and curing etc.
- (4) Providing brick masonry 340mm thick of locally available good quality bricks as per drawing referred above in cement mortar (1:5) (1 cement : 5 coarse sand) including curing, providing scaffolding, raking of joints, complete as per drawing.
- (5) Providing and laying 150mm thick plain cement concrete (1:2:4) (1 cement: 2 coarse sand : 4 crushed graded stone metal) coping continuous all-round over the width of the masonry wall including centering, shuttering as per drawing.
- (6) Plastering with 16 mm thick over brick masonry internal wall surfaces in masonry pit CM1:3 (1 cement: 3 coarse sand) including curing, raking of joints irrespective of all lead and lifts.
- (7) Providing and laying R.C.C. 1:1.5:3 (1 cement : 1.5 coarse sand : 3 crushed graded stone metal of 12 to 20mm nominal size) G-25 concrete Tank top & bottom slabs with respective thicknesses complete as per drawing referred above including screed concrete, Gauge 1000 polyurethane

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
141 of
225

sheets, shuttering, centering, curing, supply of M.S./TOR/TMT reinforcement bars including its cutting, bending positioning and binding with 16 gauge of M.S. binding wire (This includes the cost of reinforcement bars and binding wire). Frame for manhole covers are to be embedded in concrete at the time of concreting the tank top slab.

- (8) Back filling is to be done on outsides of the masonry wall with excavated or imported earth, free from all foreign matter, boulders etc. in 200mm thick layers well watered and consolidated up to top most level of tank pit.
- (9) The number of manhole chambers & covers shall be as shown in the drawings. Manholes shall not be paid separately & rate includes construction of manholes as per specifications & respective drawings.

1.2.1 Installation of 9 kl UG tank as per drawing No. LIOC/ENG/STD/29.

1.2.2 Installation of 15 kl UG tank as per drawing No. LIOC/ENG/STD/30.

1.2.3 Installation of 22.5 kl UG tank as per drawing No. LIOC/ENG/STD/31.

2.0 FUEL PIPING SYSTEM -CLASS 'C' THREADED PIPELINES

Guide for Material selection

TABLE 1 : PIPE WORK MATERIAL SPECIFICATION

PIPE WORK CLASS	NOMINAL DIAMETER (MM)	SPECIFICATION	REMARKS
Heavy Duty	ALL	BS 1387 Heavy Duty ERW Class C MS pipes Screw end	

TABLE 2 : PIPE WORK SCHEDULE

SYSTEM	CLASS	TESTING PRESSURE (kpa)	REMARKS
Fuel Fill in pipes from decantation point to tanks	HD		With Coal tar epoxy
Fuel suction pipes from tank to dispensers	HD	0.5 Kg/cm ²	With Coal tar epoxy
Fuel vent pipes (Under ground)	HD		With Coal tar epoxy
Fuel vent pipes (Above ground)	HD		

2.1 FUEL PIPING SYSTEM (CLASS 'C' MS THREADED PIPES - UNDER GROUND)

- i. Supplying heavy duty (Class 'C') MS BLACK screwed pipes as per IS Specification No.1239 (Part I), 2004 and as per standard dimensions of approved make.
- ii. Fabrication, handling, laying, & testing to a pressure of 10.5 kg/sq.cm of MS above ground pipeline of specified diameter including providing necessary flanges of material as per IS

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
142 of
225**

2062 Gr A and conforming to ANSI B 16.21, 150 Class, RF, Serrated finish , screwed fittings of heavy class such as tees, bends, elbows, spools, reducers etc., fittings screwed as per IS 554, 3 mm thick gaskets of CAF, Permanite oil as per IS : 2712, Gr 0/1 and conforming to ANSI B 16.21, 150 Class, machine bolts and nuts of material as per IS : 1367, Class 4.6/4, conforming to IS : 1363 to suit Class 150 flanges all complete as per IOC drawings, specification etc. complete as per direction of the Engineer.

- iii. Pipeline is to be laid in the required alignment along with fittings and all connections are to be made as directed by IOC engineer. Joints are to be made leak proof by using jointing materials like litharge, glycerine, shellac, hold tight, Teflon tape etc.
- iv. Cleaning and scrapping, with wire brushes & abrasives, the outside surface of the pipeline.
- v. The trenches for pipelines and any other civil work shall be paid separately under item rate.

COATING FOR UNDERGROUND PIPING:

The underground piping shall be coated as below:

- a. Mechanical cleaning of the surface to SSPC SP 2 to remove all mill scale, rust, grease and foreign particles.
- b. Paint the external surface of the pipe with 1 coat of 2 component High Build High Solid Epoxy paint (Interzone 954 of M/s. Akzo Nobel or Equivalent) to a DFT of 400 microns.
- c. Apply 1.5 mm thick bitumen based Flash Tape over the coated pipeline including sealing the joints.

- 2.1.1 80 mm dia.
- 2.1.2 50 mm dia.
- 2.1.3 40 mm dia.

2.2 FUEL PIPING SYSTEM (CLASS 'C' MS THREADED PIPES - ABOVE GROUND)

- i. Supplying heavy duty (Class 'C') MS BLACK screwed pipes as per IS Specification No.1239 (Part I), 2004 and as per standard dimensions of approved make.
- ii. Fabrication, handling, laying, & testing to a pressure of 10.5 kg/sq.cm of MS above ground pipeline of specified diameter including providing necessary flanges of material as per IS 2062 Gr A and conforming to ANSI B 16.21, 150 Class, RF, Serrated finish , screwed fittings of heavy class such as tees, bends, elbows, spools, reducers etc., fittings screwed as per IS 554, 3 mm thick gaskets of CAF, Permanite oil as per IS : 2712, Gr 0/1 and conforming to ANSI B 6.21, 150 Class, machine bolts and nuts of material as per IS : 1367, Class 4.6/4, conforming to IS : 1363 to suit Class 150 flanges all complete as per IOC drawings, specification etc. complete as per direction of the Engineer.
- iii. Pipeline is to be laid in the required alignment along with fittings and all connections are to be made as directed by IOC engineer.
- iv. The above ground pipeline is to be painted with two coats of Zinc phosphate primer of approved make and two coats of synthetic enamel paint/ Aluminium paint of approved

**SIGNATURE OF TENDERER
SEAL**



make & shade after thoroughly scrapping & removing the rust, scale, grease, mill scales etc., with wire brushes, abrasives and cleaning the surface.

- iv. Colour coding shall be as per the specifications.
- v. All the civil works involved in the item such as masonry support, plastering shall be paid separately under respective item rate.

- 2.2.1 80 mm dia.
- 2.2.2 50 mm dia.
- 2.2.3 40 mm dia.

PROVIDING LOCKING ARRANGEMENTS FOR FILL & DIP PIPES AS PER DRAWINGS INCLUDING THE FOLLOWING ITEMS OF WORKS:

- I. With clamp and lock (Approved make) 7 Lever 50mm size:
 - (i) Supply of approved make lock.
 - (ii) Providing & fabricating arrangements and fixing with nut, bolt or welded to the fill and dip pipe.
 - (iii) Supplying and fixing in locking-clamp approved make (or) equivalent approved make pad-lock of size 50mm with duplicate keys.
- II. With lock only (approved make) 7 Lever 50mm size :
 - (i) Same as Item No. (iii)

2.3 FUEL PIPING SYSTEM (CHECK VALVE -Angular)

Supplying and fixing screwed type Gun Metal valves in suction pipeline including jointing with specified materials i.e. the mixture of litharge powder and glycerin (the approved equivalent quality can be used only after the same is tested and approved by the Engineer.

- 2.3.1 Angular check valve -1 1/2" Dia (OPW Make - 40mm Dia).
- 2.3.2 Angular check valve -1 1/2" Dia (LEADER Make 40mm Dia).
- 2.3.3 Angular check valve - 2" Dia (OPW Make - 50mm Dia).
- 2.3.4 Angular check valve - 2" Dia (LEADER Make - 50mm Dia).

2.4 FUEL PIPING SYSTEM (VENT HOODS)

Supply and fixing of 'U' type MS forged bend vent hood assembly with brass wire mesh for vent hood (2 layers of brass 11 mesh per linear cm in two layers) on both the ends for vent pipes including two coats of enamel painting with approved colour.

- 2.4.1 50 mm dia Vent Hood.
- 2.4.2 40 mm dia Vent Hood.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
144 of
225**

3.0 FUEL DISPENSING UNITS

3.1 Installation of standard duty/heavy duty DUs

- a) Un-packing of the mono/duo dispensing pump from the wooden crate/packing. Wooden crate/packing shall be the property of the contractor, if applicable.
- b) Handling and shifting to the pump island and handing over loose items like nozzles, hosepipe, handles etc. to Engineer, dealer/consumer.
- c) Providing and laying CC 1:2:4 (1 cement: 2 coarse sand: 4 crushed stone metal of 12 to 20mm nominal size) for foundation bolts, including boxing as per Manufacturers requirement or as directed by Engineer. Foundation bolts are to be supplied by the contractor at no extra cost.
- d) Supply and filling of sand inside the masonry pit of the pump island.
- e) Aligning and positioning of dispensing pump over CC foundations, supplying and tightening the nuts with washers.

3.1.1 Installation of standard duty/heavy duty MONO DUs.

3.1.2 Installation of standard duty/heavy duty DUO DUs.

3.2 Installation of Multi Product Pumps / Dispensers (MPP/ MPD)

- a) Un-packing of the dispensing pump MPD/MPP from the wooden crate/packing.
Wooden crate/packing shall be the property of the contractor, if applicable.
- b) Handling and shifting to the pump island and handing over loose items like nozzles, hosepipe, handles etc. to Engineer, dealer/consumer.
- c) Providing and laying CC 1:2:4 (1 cement: 2 coarse sand:4 crushed stone metal of 12 to 20mm nominal size) for foundation bolts, including boxing with ISMC as per Manufacturers requirement or as directed by Engineer. Foundation bolts are to be supplied by the contractor at no extra cost.
- d) Supply and filling of sand inside the masonry pit of the pump island.
- e) Aligning and positioning of dispensing pump over CC foundations, supplying and tightening the nuts with washers.

3.2.1 2 product - 4 nozzle MPPs/MPDs.

3.2.2 3 product - 6 nozzle MPPs/MPDs.

4.0 SUP & INST OF AIR COMPRESSORS / DAGS

4.1 SUP & INST OF AIR COMPRESSORS

**SIGNATURE OF TENDERER
SEAL**



Supply ,installation ,testing and commissioning of horizontal air compressor assembly as per detailed specifications given below.

ELGI MAKE

Supply, installation, testing and commissioning of Air compressors ELGI make with 3 HP three phase motor (160 litres tank capacity) 8.8 cfm, 175 psi or with 5 HP three phase motor (220 litres tank capacity) 14.5 cfm,175 psi.

4.1.2 Sup & Inst of 3 HP compressor with 160 LITRES reservoir tank (Elgi).

4.1.4 Sup & Inst of 5 HP compressor with 220 LITRES reservoir tank(Elgi).

4.1.5 Installation only of supplied 3 HP/ 5 HP compressor with tank.

NEWCO MAKE

Supply, installation, testing and commissioning of Air compressors KAC make with 3 HP three phase motor (200 litres tank capacity) 11 cfm, 200 psi or with 5 HP three phase motor (500 litres tank capacity) 20 cfm,200 psi.

Installation is to be carried out as per manufacturer's specification, drawings and as directed by Engineer in Charge.

The air compressor should be of approved make, which shall be provided with air receiver ,air gauge,filter, high pressure releasing valve , safety valve,belt guard,drain cock, pressure switch etc. The 440V / 230 V, AC induction motor of approved make shall be coupled with air compressor. High-pressure valve switch shall be connected to motor control circuit in starter.

Item includes supply and fixing of approved make DOL starter (direct on line) of relevant rating, which shall be connected to motor.

4.1.1 Sup & Inst of 3 HP compressor with 200 LITRES reservoir tank (Newco).

4.1.3 Sup & Inst of 5 HP compressor with 500 LITRES reservoir tank(Newco).

4.2 SUP & INST OF DIGITAL AIR GAUGE**ELECTRONIC DIGITAL TYRE INFLATOR.**

Supply & installation of microprocessor based digital preset type inflator with automatic air pressure controller and solenoid controlled nozzle for automatic fill and release functions. Complete with weather proof cabinet, LCD displays with backlight illuminations i.e. one for actual tyre pressure and another for set pressure. Air filter, remote controller, cables, PVC hose pipe and working pressure upto 10 bar(Excluding civil work for foundation, etc.)

Operating pressure - 0 – 140 psi / 0 – 200 psi

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
146 of
225**

- Display - 2x4 digit 1" seven segment LCD backlit
or 2x3 digit 1" seven segment LED backlit
- Measuring resolution - 0.1 psi
- Display resolution - 1 psi
- Protection - IP 5
- Valves - Electrically operated solenoid (one for inflation and another for deflation)
- Operating Voltage - 230 V AC +/- 10% 50 Hz , Single phase
- 6.2.1 Supply and installation of DAG (PCL make).
- 6.2.2 Supply and installation of DAG (Clipsal/ Air Tech Make)
- 6.2.3 Supply and installation of DAG (Set Air Make).
- 6.2.4 Installation of DAG only including foundation.
- 4.3 SUP & INST OF COMPRESSED AIR PIPE LINES
- i. Supplying, laying & threading G.I. 'B' class (IS 1239, IS 4736) of approved make with all approved fittings such as tees, bends, sockets, elbows, unions, plugs reducers etc. but excluding valves.
- ii. Underground pipeline will be laid 450 mm below formation level or as required. Items including the cost of earthwork in excavation in all type of soil including Asphalted WBM/CC/RCC/Brick masonry and redoing the surface to its original condition as per IOC. Specifications.
- iii. Above ground pipeline will be held with the aid of M.S. clamps, gutties on the wall/structures etc all complete.
- iv. Making connection with municipal/existing laid pipeline/equipment, storage tanks. Item also includes providing and fixing necessary ferrule.
- v. The underground pipeline shall be protected by coating with 3 coats shalismatic bituminous paint (IS 9862).
- vi. The above ground pipeline to be painted with one coat of Etch primer (IS 5666) followed by one coat of Zinc phosphate primer and 2 coats of Enamel (IS 2933) / Aluminium paint (IS 2339) of approved make and colour.
- 4.3.1 15mm Dia.laid above ground.
- 4.3.2 15 mm Dia. laid underground.
- 4.3.3 20mm Dia.laid above ground.
- 4.3.4 20 mm Dia. laid underground.
- 4.3.5 50mm dia Pipe.

5.0 DISMANTLING INTER LOCKING PAVERS

5. 1 Removing the paver blocks and stacking at the RO premises as per the directions of the LIOC including all leads and lifts

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
147 of
225**

- 5.2 Removing the paver blocks and underlying sand cushion including stacking at the RO premises as per the directions of the LIOC including all leads and lifts.
- 5.3 Dismantling the existing Water Bound Macadam (WBM)/ Aggregate Base Course (ABC) including carting away and disposing all the debris away from the site with all leads and lifts as per the directions of LIOC.

6.0 BREAKING OF CONCRETE

Breaking of concrete of any grade including disposal of debris, including all leads and lifts etc., complete for various thickness.

- 6.1 Breaking of 150mm thick concrete.
- 6.2 Breaking of 200 mm thick concrete.
- 6.3 Breaking of 300 mm & above thick concrete.

7.0 RELAYING OF DISMANTLED INTER LOCKING PAVERS

Relaying the dismantled (supplied) inter locking pavers with 50mm thick sand bedding.

- 7.1 Relaying of inter locking pavers.

8.0 REPAIRS TO TANK TOP RCC M/H

To demolish and reconstruct the Manholes as per the drawings.

- 8.1 Fixing with existing steel frame and cover - 1200mm x 1200mm as per drawing No. LIOC/ENG/STD/23. (ZICL301101)
- 8.2 Fixing with existing steel frame and cover - 900mm x 900mm as per drawing No. LIOC/ENG/STD/24 (ZICL301102)
- 8.3 Fixing with newly fabricated steel frame and cover -1200mmx1200mm as per drawing No. LIOC/ENG/STD/23 (ZICL301103)
- 8.4 Fixing with newly fabricated steel frame and cover -900mm x 900mm as per drawing No. LIOC/ENG/STD/24 (ZICL301104)

9.0 RE-ERECTING OF DISMANTLED HOARDINGS

- 9.1 Re-erecting of dismantled 45'X15' Hoarding with new foundations (ZICL301201)
- 9.2 Re -erecting of dismantled 30'X10' Hoarding with new foundations (ZICL301202)
- 9.3 Re -erecting of dismantled 20'X8' Hoarding with new foundations (ZICL301203)

10.0 WARE PROOFING OF TANK MANHOLES

Water proofing of Tank manholes applied with two coats of Baralastic in Both the directions after replastering the internal sides & bottom of the manholes & complete as per specifications.

- 10.1 Water proofing of Tank manholes applied with two coats of Baralastic.

11.0 BATTERIES (For Dispensing Pumps)

Supplying and fixing 12 volt Charged Lead Acid SMF type battery of approved make for Electronic dispensing pumps including giving necessary electrical connection.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
148 of
225

11.1 LEAD ACID 12 V DC. SEALED MAINTENANCE FREE (SMF)TYPE BATTERY (ZIEL210100)

12.0 EXHUMING & DISMANTLING

12.1 EXHUMING OF UNDERGROUND PRODUCT TANKS

The item includes the following works:

- i)Dismantling of tanks with fittings, its pipeline connections, manhole cover plate, if any and stacking the same within the RO/CP premises.
- ii)Degassing the 10/15/20/50/70 KL Tank by filling water in the tank upto the manhole till it overflows and removing the water from the tank.
- iii)Removing dead stock, sludge oil trace and storing them in barrels at a safe place as per the direction of Engineer.
- iv) Excavating the tank from the pit, including earthwork and excavation up to the bottom most level, lifting the tank by manual or mechanical means and including dismantling earthing. Dismantling of RCC/PCC/Masonry, if done shall be paid under respective item rates.
- v)Stacking the 10/15/20/50/70 KL tank within the premises.
- vi)Backfilling of the exhumed tank pit, if done shall be paid separately.

Exhuming of tanks of following capacities with fittings including connected civil works, breaking of concrete slab, disposing of debris etc.

- 12.1.1 09 KL Tank
- 12.1.2 15 KL Tank
- 12.1.3 22.5 KL Tank

12.2 DISMANTLING OF DISPENSING UNITS

- a) Removing of dispensing pump mono /duo MPD/MPP from foundation, including disconnection of pipeline, electrical connections, removal of foundation bolts , etc.
- b) Handling and shifting from the pump island to a safe place and handing over loose items like nozzles, hosepipe, handles etc. to Engineer, dealer/consumer.

Removing connected dispensing pump from pedestal including disconnection of pipeline, electrical connection, removal of nuts of the foundation bolts etc. complete.

- 12.2.1 Mono pump
- 12.2.2 Duo pump
- 12.2.3 MPD / MPP

12.3 DISMANTLING OF AIR COMPRESSOR / DAG

Removing connected Air Compressor / DAG from pedestal including disconnection of pipeline, electrical connection, removal of nuts of the foundation bolts etc. complete.

- 12.3.1 Air compressor (3hp /5hp).
- 12.3.2 Digital Air Gauge.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
149 of
225

12.4 DISMANTLING PRODUCT PIPING

This item includes the following item of works:-

Above Ground:

- i) Dismantling of all pipelines, fittings like flanges, check valves, elbows, bends, sockets union nipples etc., including cutting, if required, as per site conditions.
- ii) Stacking of all the above material within the RO/CP premises and handing over the material to the Engineer.
- iii) Any other facilities/equipment (which is not required to be dismantled), if damaged while carrying out the above job shall be made good at contractors cost.

Underground

- i) Same as item No .(I) to (iii) under above item.
- ii) Excavation in trenches, in all types of soil (upto 2m maximum), WBM/Asphalted area etc.
- iii) Uplifting the pipe from trenches, cutting the same in appropriate lengths after dismantling the sockets/flange joints.
- iv) Back filling the trenches with the excavated or imported earth, watering and consolidating with hand roller.

Disconnecting, dismantling existing welded/ screwed MS/ GI pipeline both above/underground including dismantling of clamping or excavating, back-filling, restoring the surfaces into original condition, disconnecting all fittings, stacking the dismantled pipes/fittings at site as directed.

12.4.1 Dismantling 80 mm dia P/L

12.4.2 Dismantling 50 mm dia P/L

12.4.3 Dismantling 40 mm dia P/L

12.4.4 Dismantling 25 mm dia P/L

12.4.5 Dismantling 20 mm dia/ 15 mm dia P/L (airlines)

12.5 DISMANTLING ACCESSORIES (MSP/YARD LIGHTS/GAD ETC.)

i) Dismantling of signages and light poles from foundation, including the dismantling of electrical connections & fitting.

ii. Stacking of the above within the RO/CP premises.

12.5.1 Exit/ Entry signage/ Digital Air gauge

12.5.2 Main Signage (MSP)

12.5.3 Yard light pole

12.6 DISMANTLING ACCESSORIES (HOARDINGS)

12.6.1 45'X15' Hoarding.

12.6.2 30'X10' Hoarding.

12.6.3 20'X8' Hoarding.

13.0 SUPPLY & INSTALLATION OF TANK FITTINGS

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
150 of
225

Supplying and fixing of MS threaded tank fittings, such as caps, bush, coupling, Nipple and Union as specified in price schedule.

13.1 TANK FITTING -GI & Brass End Caps

- 131.1 GI End Caps- 40mm dia for suction pipe
- 13.1.2 GI End Caps - 50 mm dia.for suction pipe
- 13.1.3 Brass End Caps- 50mm dia for dip pipe
- 13.1.4 Brass End Caps - 80 mm dia.for fill pipe

13.2 TANK FITTING -MS BUSH (SLEAVES)

- 13.2.1 100 x 80 mm – Bush
- 13.2.2 80 x 50 mm – Bush
- 13.2.3 50 x 40 mm – Bush

13.3 TANK FITTING - MS Coupling

CAM LOCK COUPLING.

- a) Supplying and fixing of camlock coupling male adaptor with female thread including locking arrangement as per specification
- b) Supply and fixing female coupler/ hose shank with cam arms as per specification

The detailed specification is given below.

Working pressure : up to 10 kg/cm²

Working temperature: -10 C to 55 C

Material of Construcion:

Body & Dust Cap: Cast Aluminium LM9/LM6

Cam arms : SS 304

Gaskets : Teflon

- 13.3.1 80 mm dia.-Coupling
- 13.3.2 50 mm dia.-Coupling
- 13.3.3 40mm dia-Coupling

13.4 TANK FITTING - MS Barrel Nipple

- 13.4.1 80 mm dia.- Barrel Nipple
- 13.4.2 50 mm dia.- Barrel Nipple
- 13.4.3 40 mm dia.- Barrel Nipple

13.5 TANK FITTING - MS Union

- 13.5.1 80 mm –Union
- 13.5.2 50 mm -Union
- 13.5.3 40 mm union for Dispensing Pump

13.6 TANK FITTING - PERMANITE OIL PACKING

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
151 of
225

Replacing existing manhole gaskets for 9/15/22.5 KL U/ G tanks including disconnecting the pipelines, removing nuts, bolts & manhole cover and supplying and fixing permanite oil gaskets, nuts & bolts and reconnecting the pipeline.

Removal & Refix the existing circular steel Manhole cover in product Tanks with permanite oil packing as per drawing.

13.6.1 With existing 3 mm thick oil packing in single M/H Tank

13.6.2 With new 3 mm thick oil packing in single M/H Tank

13.6.3 With new 3 mm thick oil packing in three M/H Tank

13.7 TANK FITTING - MS Bolt and Nut in the Tank Manhole

13.7.1 Replace MS Bolt and Nut in the Tank Manhole (Out of 22 Nos)

13.8 TANK FITTING - Dip rods for Tanks

Supplying of dip rods conforming to detailed specification.

13.8.1 Dip rods for 09/15/22.5 KL Tank

14.0 OTHER TANK WORKS

Cleaning of UG tanks including removal and re fixing of manholes

14.1 UG TANK – CLEANING

CLEANING OF 9KL /15KL / 22.5 KL TANKS:

Item includes following jobs:

- (i) Removal of dead stock from the tank and collecting the same in supplied empty barrels and handing over the same to the owner.
- (ii) Degassing the tank by filling the water in tank up to the manhole till it overflows and removing the water from the tank.
- (iii) Removing the sludge from the tank and dumping the same at the place indicated by the engineer in charge or the consumer.
- (iv) Cleaning the inner surface of the tank with soap water solution and hessian cloth and removing all foreign matter from the tank. The cleaning process shall be carried to the full satisfaction of the engineer.
- (v) Refixing the manhole cover with new 3mm thick permanite oil packing and also replacing defective nuts and bolts for manhole cover as well as pipeline connection to the tank including connecting/jointing all pipelines to tanks.
- (vi) Back filling the manhole pit and clearance of site including removal of malba, if any.

14.1.1 9 kl UG Tank

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
152 of
225**

14.1.2 15 kl UG Tank

14.1.3 22.5 kl UG Tank

14.2 UG TANKS - PUMPING OUT WATER

Removing the water carefully from U/G tank with SR pump, in such a way that there is no loss of product. The water has to be thrown away and the product to be put back into the tank etc. complete.

Removal of rain water at the bottom of Tank mixed with fuel (Rate shall include for separation of water & fuel) The works must be carried out using hand pumps/ pneumatic pump only.

14.2.1 Tanks of 9/ 15/ 22.5 KL capacity

14.3 UG TANK - EMPTYING OUT PRODUCT

Removal of dead stock from the tank and collecting the same in IOC/consumer supplied empty barrels and handing over the same to IOC/Dealer. It shall be ensured that no loss of product is taken place, while carrying out the job. The job will be carried out in the presence of Corporation and dealers representatives.

Supplying & Filling sweet water in the underground tank to avoid floating of the tanks during monsoon, etc. as directed.

Removing product from the underground tanks and emptying it including collecting the product in barrels supplied by the LIOC/ dealer. It shall be ensured that no loss of product takes place while carrying out the job. The job will be carried out in the presence of LIOC and dealers representatives. The works must be carried out using hand pumps/ pneumatic pump only.

14.3.1 Tanks of 9/ 15/ 22.5 KL capacity

14.4 UG TANKS - PRESSURE TESTING

HYDROSTATIC TESTING OF 15/22.5 KL TANK:

- (i) Removal of product (dead stock) if any / or sludge etc., by manual labour.
- (ii) Opening the tank & making it gas free.
- (iii) Supply of water and filling the same in the tank for testing.
- (iv) Testing the tank as per specification.
- (v) Rectifying leaks if any, however it shall be paid separately depending upon the quantum of work.
- (vi) Removal of water from the tank & its disposal outside premises.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
153 of
225

- (vii) Cleaning the tank thoroughly from inside with Gunny bags, soft cloth etc. & reconnecting the pipeline, fitting including replacement of packing nuts and bolts etc., if required for commissioning the tank.
- (viii) After testing the tank hydrostatically, the gasket used in the manhole cover has to be replaced with new one.

Testing the tank hydro-statically with sweet water, to a pressure of 0.50 Kg/Sq.cm. (Testing includes supplying, filling and emptying out the water after testing) cleaning the internal surface of the tank etc. complete.

14.4.1 09 KL Tank

14.4.2 15 KL Tank

14.4.3 22.5 KL Tank

14.5 FUEL PIPING SYSTEM (reducer/Expander & NRV)

14.5.1 Supply & installation of Reducer/Expander for suction line (40/50MM)

14.5.2 1 1/2" Non return valve (OPW make) for suction lies

14.6 FUEL PIPING SYSTEM (PRESSURE TESTING PIPE LINES)

HYDROSTATIC TESTING OF MS PIPELINE INCLUDING CLEANING, SCRAPPING ETC. COMPLETE AS PER IOC SPECIFICATION:

- (ii) Exposing the underground pipeline from all sides by excavating the pipeline trench up to required depth and back filling the same after the testing of pipeline or doping is complete.
- (iii) Item includes rent for hydraulic pump & water for testing.
- (iv) Filling water in the pipeline.
- (v) Removal of product from pipeline to be tested in the barrels, flushing etc., before undertaking testing.
- (vi) Testing pipeline at 7 kg/sq.cm, keeping it for 48 hours and rectifying the leakage if any.
- (vii) Removal of water & its disposal outside the RO/CP.
- (viii) Item includes cleaning and scrapping the pipeline complete.

Hydrostatic testing of MS pipeline complete as per LIOC specification, including supply of water and emptying out water after testing.

14.6.1 40/50mm dia MS pipeline testing

14.6.2 80 mm dia MS pipeline testing

15.0 TRANSPORTATION

The above item includes the following item of works:

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
154 of
225**

- i) Handling, loading, unloading and transportation of 9/15/22.5 KL Tank with fittings/ dispensing pump/ air compressor/ other pumps from one location to another. Loading & Transportation of new tanks from the workshop is in the scope of the tank fabricator.
- ii) The dispensing units /air compressor / all other pumps/ transported is by number basis.
- iii) No extra payment shall be made for loading/unloading the tank, pump etc. with chain pulley block or any other mechanical method, staging, ramps etc.
- iv) Octroi, if paid, shall be reimbursed on production of receipt. Forms for interstate transfer shall be provided by corporation.
- v) Transporter shall be responsible for any damages and losses during loading/unloading and transporting of material. If the materials are required to be insured for "Transit Insurance", expenses towards the same shall be borne by the Contractor. Any damage caused during transportation, loading, unloading and handling shall be at the risk and cost of the contractor.
- vi) Contractors may be asked to pack the materials and in that event, packing charges shall be paid extra on mutually agreed rates.
- vii) The item includes taking delivery of material from the prescribed location, transporting and delivery of the same at destination as per the instruction of despatch location.
- viii) The payment shall be made on the basis of shortest distance between two locations and the kilometerage shall be given on the basis of Corporation working and the contractor shall be bound by the same.

ix) Payment shall be made on production of MRN only, along with bills.

15.1 TRANSPORTATION OF DISPENSING UNITS & OTHER EQUIPMENT

Transportation of DUs, DAG, Comp, nitrogen inflator, Yard Lights (paid one way only) including loading & unloading.

- 15.1.1 i. Upto 50 Km
- 15.1.2 ii. Additional - 51 to 100 KM
- 15.1.3 iii. Additional - 101 to 200 KM
- 15.1.4 iv. Additional - over 200 KM

16.2 TRANSPORTATION OF TANKS, MSP Etc.

- i) Handling, loading or unloading of 9/15/22.5 KL tanks & MSP with all fittings by mechanical means only
- ii) Contractor shall be responsible for any damages / losses during loading/unloading.

Transportation of Tanks, MSP etc (paid one-way only) including loading & unloading.

- 16.2.1 i. Upto 20 Km
- 16.2.2 ii. Additional - above 20 KM

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
155 of
225

ELECTRICAL SPECIFICATION

PARTICULAR SPECIFICATIONS

The particular specification (ELECT) shall be read in conjunction with the General Specification where applicable. Where the particular specification is in conflict with the General Specification, the Particular Specification shall prevail.

All the British codes referred in the general specification shall conform to the latest relevant British standards.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
156 of
225

DETAILED ITEMWISE DESCRIPTION FOR ELECTRICAL WORKS

General:

The entire electrical installation work shall be carried out in accordance with approved drawings and in general conformity with the requirements of The Relevant BS Codes of Practice as amended to date, wherever applicable and the regulations of The Local Licensing Bodies/C.E.B etc., and where such installations are subject to inspection and approval of fire insurance and explosive authorities, the installation shall be planned and executed conforming to their regulations/rules.

WORKMANSHIP

First class workmanship and neat appearance are the essential requisites for compliance with these specifications.

MATERIALS & MAKES

All materials, equipment, fittings, fixtures, appliances, accessories, etc., to be used in the installation shall conform to the relevant SL Standard specifications.

The make shall be as per approved make list enclosed. In case of any ambiguity the best of the all makes available and as decided by the Site Engineer shall be used.

SERVICE CONNECTION

Contractor has to obtain the necessary service connection from the Electricity Board by paying the statutory payment. The payment made shall be reimbursed on production of cash bill by the client at the given rate of BOQ.

For all the fabricated items, namely MV panel, SSB, DB etc., the general arrangements / fabrication drawings are to be prepared and approval obtained from consultant/ company, before commencing fabrication.

GENERAL SPECIFICATION FOR ELECTRICAL INSTALLATION

1. Work shall be carried out by an experienced electrical contractor who has had experience in similar projects and shall have necessary tools, equipment and experienced staff for electrical installation and testing.
2. The electrical installation is designed for 400/230 volts 3 phase 50 Hz with earthed neutral.
3. In every respect all work shall conform to the 16th edition of the Institution of Electrical Engineers (London) wiring regulations. Any deviation shall be to the approval of the Engineer/Consultant.
4. Positions shown in the drawings for all electrical equipment are approximate and actual position will be decided at the site and shall be marked on the contractor's shop drawings.
5. When procuring main cables the bidder shall take into account actual physical measurements to avoid joints. Special orders shall be placed with manufacturers for cable lengths more than 100 meters.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
157 of
225**

Before conduit pipes are laid on concrete floor slabs a conduit layout drawing shall be prepared by the contractor for the approval of the Engineer / Consultant / 2 copies of this drawing shall be submitted to the client for the future reference.

It is responsibility of the electrical contractor to repair all walls, slabs etc., to the satisfaction of the Engineer / Consultant. No extra payments will be paid for this.

All items shall be of reputed makes and a sample shall be forwarded to the Engineer / Consultant for his approval. No item shall be produced without the approval of the Engineer / Consultant. Main switchboards and fluorescent lights shall be by reputed manufactures to the approval of the Engineer / Consultant.

All imported products & fittings shall have the country of manufacture and the specification number marked distinctly.

10. Rates quoted shall include

Labour, transport, overheads, profits.

All accessories such as clips, screws, junction boxes, round blocks, 3 core flex cable, ceiling roses, GI rods, GI chains, hooks, holder, bulb etc,
Testing and commissioning.

11. Fixing Heights

Fixing heights from floor level, unless directed otherwise, shall be as follows:

Main switches (switch fuses)	-	1.75 m
Distribution boards	-	1.75 m
Lamp fittings	-	2.40 m
Ceiling fans	-	2.50 m
Switches and fan regulator	-	1.40 m
Socket outlets	-	0.30 m (Or as instructed)

EQUIPMENT SPECIFICATIONS

Main Switchboard

Totally enclosed wall mounted cubical type switch board shall be suitable for 400/230 volts 3 phase 4 wire supply and be fabricated with 16 S.W.G. mild sheet metal conforming to BS 5486 or equivalent. It shall have hinged door in front. It shall be painted with one coat of anti-corrosive paint and powder coated to an approved colour. All circuit breakers, meters etc, shall be flush mounted and bus bars shall be insulated hard drawn copper. Moulded case circuit breakers (MCCB) shall have breaking capacity more than 35 kA – and shall conform to BS 4752. Voltmeters and Ammeters shall be moving iron type and shall have a dial of approximately 100 mm. They shall conform to BS 89. All current transformers shall be class 'C' type and shall conform to BS 3938.

All MCCB's shall be adjustable thermal and magnetic tripping. Height of the switch shall not be more than 1.8 meters. All MCCB's shall be labeled to indicate area it feeds.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
158 of
225**

Bus Bar Riser

Bus bar riser shall consist of 4 numbers hard drawn high conductivity copper bus bars of equal cross section to carry the full rated current continuously. It shall be totally enclosed with GI sheet non-ventilated type conforming to BS 5486 or IEC 439 or equivalent specification. It shall be rated for a fault current of 35 K amps and shall have tap off points at every 1000 mm. All jointing areas and tap off contact areas of the bus bars shall be silver plated to give a long reliable service. It shall be supported at every 1000 mm. Fire barriers shall be provided at each floor level and suitable expansion joints shall also be provided.

Changeover Switch

Changeover switch shall be a two pole on load changeover type having an off position for 230 volts and four pole on load changeover type having an off position for 400 volts system. Off load changeover switches are not accepted.

Earth Fault Relay

Earth fault relay shall be an electronic type having adjustable time and current settings. It shall have a button for testing purposes. The time and current setting ranges are subjected to the approval of the Engineer/Consultant. A separate core balanced type current transformers shall be provided to detect the earth leakage current.

Molded Case Circuit Breakers (MCCB)

MCCB's shall be a reputed make conforming to BS 4752. It shall have a breaking capacity more than 35 K amps and shall have adjustable thermal overload and magnetic short circuit protection. Individual MCCB's shall be enclosed in a stainless steel enclosure with a suitable neutral link. It shall be fixed type having bus bar connecting type terminals to fix cables with crimped cable end sockets.

MCB Distribution Board

Shall be a reputed make conforming to BS 5486 or equivalent. It shall be flush mounted with a hinged door. Bus bars, neutral bar and earth bar shall be hard drawn copper. Sample or a sketch shall be forwarded for approval. Molded PVC type boards are preferred.

Miniature Circuit Breakers (MCB)

MCB's shall be reputed make having thermal overload and magnetic short circuit protection and shall conform to BS 3871 DIN rail type. The breaking capacity shall be more than 10000 amp and type 2 shall be used for the lighting circuits and motor circuits type 3 shall be used.

Residual Current Devices (RCD's)

RCD's shall be current balance type complying to BS 4293. Sensitivity shall be 30 m amps or as specified in the drawing.

Switch Fuses

Switch Fuses shall be molded case type for single phase and iron clad type for 3 phase having rewirable fuses conforming to BS 3036. It shall be a reputed make conforming to BS 5419.

PVC Cables

All cables shall be 450/750 volts grade PVC sheathed copper complying with SLS 733. (BS 6004). Red colour shall be used for the phase conductor and black colour shall be used for the neutral conductor.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
159 of
225

The protective conductor (earthing) PVC insulated copper shall be green or green and yellow colour jointing of cables is not accepted. Where the cable length is more than 100 meters special order shall be placed with the manufacturers. All cable length is more than 100 meters special order shall be placed with the manufacturers. All cable sizes 7 / 0.67 mm and above shall be crimped.

10 amp Switches and 20 amp DP Switches

They shall be flush type white colour complying with BS 3676.

13 amp Socket Outlets

They shall be flush type with switch, white in colour complying with BS 1363.

PVC Conduit Pipes, Switch Boxes, Round Blocks and Junction Boxes

They shall comply with BS 4607 or equivalent. Switch boxes, junction boxes shall be PVC junction molded type and handmade boxes shall not be used. Switch boxes shall be with brass fixing screws. In places where pipes are not buried they shall be clipped at 500 mm intervals.

Screws and Panel Pins

All screws and panel pins shall be brass, brass plated items shall not be used.

Ceiling Roses

Ceiling Roses shall be 3 plate type and shall conform to BS 67 or equivalent. Connections to all lamps, fans shall be through a ceiling rose unless otherwise instructed.

Lamp Holders

All lamp holders shall bayonet cap type conforming to BS 5042 or any other type specified. C G holders shall be brass type.

Incandescent Bulbs

All incandescent bulbs shall be with bayonet cap type base and shall comply with BS 161 or any other type specified.

Earth Electrodes

Earth electrodes shall be made of copper plate OR CI Pipes as indicated in the drawing and the connecting tape shall be fixed with a brass nut and bolt, gully and cover slab shall be provided for inspections. Rate shall include connecting tape in PVC conduit pipe.

Ceiling Fans

1400 mm ceiling fans shall be 3 blade type, complete with choke type regulator with 5 speed positions conforming to BS 5060 or equivalent. In addition to the regulator there shall be a 10 amp switch to control the fan. Fan hook shall be made with 12 mm MS bars, where necessary rate shall include extending the fan rod and painting. Connection to the fan shall be through a ceiling rose or connection bar.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
160 of
225**

Exhaust Fans

Wall mounted exhaust fans shall be a reputed make suitable for 230 volts 50 Hz operation. The motor shall be a totally enclosed type having a speed be preferably less than 1000 r.p.m. Literature giving the performance of airflows and noise level shall be submitted for approval.

Fluorescent Lamp Fittings

Fluorescent fittings shall be of approved design and of a reputed make. It shall be made with 22 SWG M.S sheet and painted with one coat of anti-corrosive paint and powder coated. It shall have a parallel connected power factor connecting capacitor.

All accessories shall conform to

Choke	BS 2818
Tubes	BS 1853
Starters	BS 3772
Condenser	BS 4017
Holder	BS 5042

All fluorescent fittings shall be earthed.

Watt-hour Meters

Watt-hour meters shall be 3 phase 4 wire and shall conform to BS 5685.

1.0 ELECTRICAL INSTALLATION (Point wiring)

INTERNAL WIRING SYSTEM

Point Wiring, Circuit Wiring & Flexible Wiring

1. This specification covers the requirement of cabling system installation work. The installation, testing and commissioning of the complete cabling system (i.e. Cables, cable carrier system, terminations and all accessories required to make the system complete) shall be carried out in accordance with this specification.

2. The installation work shall include unloading at site, receipt of materials from LANKA IOC PLC's stores / storage yard, transportation to contractor's stores / yard / workshop, storing in contractor's stores / yard (all these activities are applicable if the cables are supplied by LANKA IOC PLC), erection, jointing / termination, testing, commissioning and any other work items necessary for completing the job.

3. The contractor shall furnish all supervision, labour, tools, welding equipment, tackles and testing equipment as required for installation, testing and commissioning work. All incidental hardware and miscellaneous items such as saddles, spacers, nuts/bolts/washers, anchor fasteners, cable route and joint markers and protective covers for buried cables, earthing as required for the cabling installation shall be deemed to be included by the contractor as part of the installation work.

4. Major civil works like construction of cable trenches, cable tunnels and duct banks are in contractor's scope but the same shall be paid separately. The required embedment plates shall be

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
161 of
225**

provided by the contractor by using anchor fasteners if the same are not provided by others. However, minor civil works such as making holes / grooves in floor slab/wall, and patching up in an approved manner any holes made in the walls / floors, embedment of short lengths of conduits, plates in floors walls, etc. shall be deemed to be included in the scope of work.

5. Wires shall comply the following features:

(i) PVC insulated with a rating of 105 deg.c bright annealed electrolytic grade (99.9% pure) copper stranded conductors multi drawn simultaneously (twisted conductors) for uniformity of resistance, dimension and flexibility.

(ii) 660 v grade, FRLS, wires for single phase circuits and 1000 v grade for 3 phase circuits.

(iii) Colour coded as below:

Phase - R	-	Red
Phase - Y	-	Yellow
Phase - B	-	Blue
Neutral	-	Black
Earth	-	Green

6. WIRING GENERAL

System of distribution and wiring

A) The main distribution board and branch distribution board shall be controlled or provided with linked switch fuse unit or miniature circuit breaker (MCB) of specified rating on the phase or live conductor or combined phase and neutral control gear for incoming and out-going as indicated in the BOQ.

B) Balancing of circuits

(i) The balancing of circuits in three wire or poly phase installations shall be arranged before hand to the satisfaction of the engineer in charge.

Wiring system

Unless and otherwise specified in the tender documents, wiring shall be done only by the "looping system". Phase or live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

Lights, fans and call bells shall be wired in the 'lighting' circuits. 15A/16A socket outlets and other power outlets shall be wired in the 'power' circuits. 5A/6A socket outlets shall be wired in the 'lighting circuits'.

The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear.

Run of wiring

The type of wiring shall be as specified in tender documents, i.e.

(i) Conduit.

(ii) Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.

(iii) In no case, the open wiring shall be run above the false ceiling without the approval of engineer-in-charge.

(iv) In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
162 of
225**

Joints in wiring

No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and /or protective conductors in wiring shall be permitted.

There shall be no joints in the through-runs of cables. If the length of final circuit or sub main is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.

Termination of multi-stranded conductors shall be done using suitable crimping type thimbles.

Conformity to SLS rules, and standards

All electrical works shall be carried out in accordance with the provisions of Indian electricity act, 1910 and Indian electricity rules, 1956, amended up to date.

The works shall also conform to relevant Indian standard codes of practice (cop) for the type of work involved.

In all electrical installation works, relevant safety codes of practice shall be followed.

General requirements of components

A) Quality of materials

All materials and equipments supplied by the contractor shall be new. They shall be of such design, size and material as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

B) Conformity to standards

All components shall conform to relevant Indian standard specification, wherever existing. However, for conduits, wiring cables, piano switches and socket outlets, ISI marked materials shall only be permitted.

The Indian standards, including amendments or revisions thereof upto the date of tender acceptance, shall be applicable.

Interchangeability

Similar parts of all switches, lamp holders, distribution fuse boards, switchgears, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

Cables

A) Wiring cables

(i) Conductors of wiring cables (other than flexible cables) shall be of aluminium or copper, as specified.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
163 of
225**

(ii) Stranded aluminium conductor shall not be used in wiring cables up to and including 6-sq.mm size.

(iii) Unless and otherwise specified, copper conductor of size 1.5 sq mm and above used for wiring shall be stranded.

B) Flexible cables

(i) Conductor of flexible cables shall be of copper. The minimum cross sectional area of conductor for flexible cable shall be 0.0006 sq. Inch (14/. 0076" or 14/0.193 mm).

(ii) Only 3 core flexible cables shall be used for connecting single-phase appliances.

(iii) Unless armour, or tough rubber, or PVC sheath mechanically protects the flexible cables, these shall not be used in workshops and other places where they are liable to mechanical damage.

Flexible cable connection to bell push from ceiling rose shall be taken through steel conduit /metallic casing and capping.

Point wiring

Definition

A point (other than socket outlet point) shall include all works necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall, however, includes the wiring work necessary in tapping from another point in the same distribution circuit: -

(i) Ceiling rose or connector (in the case of points for ceiling /exhaust fan points, pre-wired light fittings and call bells).

(ii) Ceiling rose (in the case of pendants except stiff pendants)

(iii) Back plate (in the case of stiff pendants)

(iv) Lamp holder (in the case of gooseneck type wall brackets, batten holders and fittings which are not pre-wired)

(v) In the case of call bell points, the words " from the controlling switch or MCB" shall be read as "from the ceiling rose meant for connection to bell push".

Scope

(i) Following shall be deemed to be included in point wiring

Conduit, accessories for the conduit and wiring cables between the switch box and the point outlet. [see also (h) below].

(a) Where false ceiling is provided, the point shall be upto the false ceiling level and wiring shall be done upto the point without any joints. Connectors shall be provided at the fitting. Flexible conduit shall be used and couplers shall be provided to connect the rigid conduit with the flexible conduit. Connectors shall be provided at the fitting.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
164 of
225**

(b) Loop wiring in rigid/flexible conduit

(c) All fixing accessories such as clips, nails, screws, phil plug, raw plug etc. as required.

(d) Metal switch boxes for control switches, regulators, sockets etc. Recessed or surface type, and phenolic laminated sheet covers in case of piano type switches and outer & inner cover plates in case of modular type switches.

(e) Outlet boxes, junction boxes, pull-through boxes etc. But excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.

(f) Control switch as specified.

(g) Ceiling rose or connectors shall be provided near the fitting as required.

(h) Connections to ceiling rose, connector, lamp holder, switch etc.

(i) Interconnecting wiring between points on the same circuit, in the same switch box or from another.

(j) Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets. (The length of protective conductor run along with the circuits/submains is excluded from the scope of points).

(k) Bushed conduit or porcelain tubing where wiring cables pass through wall etc.

MEASUREMENT FOR POINT WIRING

Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, PLUG POINTS, exhaust fan points and call bell points. These shall be measured on unit basis by counting.

No separate measurement will be made for interconnections between points in the same distribution circuit and for the circuit protective (loop earthing) conductors between metallic switch boxes.

MEASUREMENT FOR Point wiring

The light plug (5A/6A) point and power (15A/13A) point wiring shall be measured on lum some basis, from the respective tapping point of live cable, namely, switch box, another socket outlet point, or the sub-distribution board as the case may be, up to the socket outlet.

The metal box with covers, /MCB, Light fittings and other accessories shall be measured and paid as a separate item.

The power point outlet may be 15A/6A or 13A/5A six pin socket outlet, where so specified in the tender documents. (2 pin or 5 pin socket outlet shall not be permitted).

Light/ fan/5A plug points using ordinary switch/ socket using 1.5 sq.mm flexible FRLS copper conductor wiring cables from switch box to light/fan/plug points including supply and fixing metal

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
165 of
225**

switch box, hylum sheet, PVC conduits and 1.5 sq mm single core PVC insulated Copper wire (green colour) as continuous earth

1.1.1 Point wiring for light fittings.

1.2 ELECTRICAL INSTALLATON (13 Amp/15Amp socket outlets)

13A/15A Power plug points with ordinary switch and socket. Using 2.5 sq.mm flexible FRLS copper conductor wiring cable from DB including supply and fixing metal switch box, hylum sheet, PVC conduits, 15A switch and socket and 1.5 sq mm single core PVC insulated Copper wire (green colour) as continuous earth.

1.2.1 13 Amp switch socket outlet with wiring.

1.2.2 15 Amp switch socket outlet with wiring.

1.3 ELECTRICAL INSTALLATON (Telephone socket)

1.3.1 Telephone socket outlets with wiring.

1.3.2 10 pair TP junction box with wiring.

2.0 ELECTRICAL INSTALLATON (Lighting fixtures)

General requirements

A) Outdoor fittings shall be weather-proof and water-proof type.

B) All luminaires shall be supplied complete with lamps suitable for operation on a supply voltage and the variation in supply voltage and frequency prevailing at site.

C) Fluorescent type, mercury vapour, sodium vapour and metal halide type luminaries shall be complete with accessories like lamps, ballasts, power factor improvement capacitors, starters etc. These shall be mounted as far as possible in the luminaire housing only. If these can not be accommodated integral with the luminaire then a separate metal enclosed control gear box shall be included to accommodate the control accessories together with a terminal block suitable for loop-in, loop-out connections. Outdoor type fixtures shall be provided with outdoor weather-proof box with minimum degree of protection IP 65.

D) Fluorescent type luminaires with more than one lamp shall be provided with capacitors connected in lead-lag circuit for correction of stroboscopic effect.

E) Each luminaire shall have a terminal block suitable for loop-in, loop-out and t-off connection by 1100 V, 1 core PVC insulated copper conductor wires upto 6 sq.mm in size. In outdoor corrosive and hazardous areas the termination at the luminaire shall be suitable for 1100 V, PVC insulated copper/ aluminum conductor, armoured cables of sizes upto 6 sq.mm conductor. Terminals shall be of stud or clamp type. The internal wiring shall be completed by the manufacturer by means of stranded copper wire of minimum 1.5 sq.mm size and terminated on the terminal block. Terminal blocks shall be mounted with minimum two fixing screws.

Earthing

A) Each luminaire shall be provided with an earthing terminal suitable for connection to the purchaser's earthing conductor of 1.5 sq mm stranded PVC wire or unless otherwise specified.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
166 of
225**

B) Where separate control gear box is provided for housing the accessories, the same shall be provided with an earthing terminal suitable for connecting external earthing conductor.

C) All metal or metal enclosed parts of the luminaire / control gear box shall be bonded and connected to the earthing terminal so as to ensure satisfactory earthing continuity.

D) Painting / finish

E) All surfaces of the luminaire / control gear box housing accessories shall be thoroughly cleaned and degreased. It shall be free from scale, rust, sharp edges and burrs.

F) The luminaire housing shall be stove-enamelled / epoxy stove enamelled / vitreous enamelled or anodised as indicated under various types of fittings. Aluminium paint on flame proof fittings is prohibited.

G) The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg, over 12.5 mm die mandrel.

H) The finish of the luminaire shall be such that no bright spots are produced either by direct light source or by reflection.

I) External control gear box provided for housing accessories shall be painted or galvanised

Accessories for luminaires

A) Reflectors

B) The reflectors shall be made of CRCA sheet steel I aluminium / silvered glass / chromium plated sheet copper as indicated for above mentioned luminaires.

C) Reflectors made of steel shall stove enamelled / vitreous enamelled / epoxy coating finish. Aluminium used for reflectors shall be anodized / epoxy stove enamelled / mirror polished.

D) Aluminium paint on the reflectors of flame proof lighting fittings is prohibited.

E) Reflectors shall be free from scratches or blisters and shall have a smooth and glossy surface having an optimum light reflecting coefficient such as to ensure the overall light output specified by the manufacturer.

F) Reflectors shall be readily removable from the housing for cleaning and maintenance without disturbing the lamps and without the use of tools. They shall be securely fixed to the housing by means of positive fastening device of captive type.

G) Lamp / starter holders.

H) Lamp holders shall comply with relevant standards. They shall have low contact resistance, shall be resistant to wear and shall be suitable for operation at the specified temperature without deterioration in insulation value. They shall hold the lamps in position under normal condition of shock and vibration met with under normal installation and use.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
167 of
225**

I) Lamp holders for the fluorescent lamps shall be of the spring loaded bi pin rotor type. The lamp holder contacts shall provide adequate pressure on the lamp cap pins when the lamp is in working position.

J) Lamp holders for incandescent, MLL blended, metal halide, mercury vapour and sodium vapour lamps shall be of edison screw (E.S.) Type.

K) Starter holders for fluorescent lamps shall conform to relevant standards. All material used in the construction of the holder shall be suitable for tropical use.

Ballasts

A) The ballasts shall be designed, manufactured and supplied in accordance with the relevant standards. The ballasts shall be designed to have a long service life and low power loss.

B) Ballasts shall be mounted using self locking, anti-vibration fixings and shall be easy to remove without demounting the fittings. They shall be in dust tight, non combustible enclosures.

C) The ballasts shall be of the inductive, heavy duty type copper wire wound, filled with thermosetting, insulating, moisture repellent polyester compound filled under pressure or vacuum. Ballasts shall be provided with taps to set the voltage within the range specified in project information. End connections and taps shall be brought out to a suitable terminal block rigidly fixed to the ballast enclosure. Ballasts shall be free from hum and such of those which produce hum shall be replaced by contractor free of cost.

Separate ballast for each lamp shall be provided in case of multi lamp luminaires, except in the case of 2 x 20 watts luminaires.

1. Electronic ballast

Electronic ballast shall be suitable for 1 x 36 w/40 w, 2 x 36 w/40 w fluorescent lamp and shall be energy saving, warm start type having a power factor better than 0.96, having an optimum wattage delivery to the lamp. The choke shall be suitable for 180-270 v ac for operation at ambient temperature range of -150c to +50 c.

2. Starters

A) Starters shall have bimetal electrodes and high mechanical strength. Starters shall be replaceable without disturbing the reflector or lamps and without the use of any tool. Starters shall have brass contacts and radio interference capacitors.

B) The starters shall generally conform to the relevant standards.

3. Capacitors

A) The capacitors shall have a constant value of capacitance and shall be connected across the supply of individual lamp circuits.

B) The capacitors shall be suitable for operation at supply voltage as specified and shall have a value of capacitance so as to correct the power factor of its corresponding lamp circuit to the extent of 0.95 lag or better.

C) The capacitors shall be hermetically sealed preferably in a metal enclosure to prevent seepage of impregnant and ingress of moisture.

Installation of lighting fixtures

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
168 of
225**

The installation of lighting fixtures shall be based on the mounting arrangement as required at site. Unit rate for lighting fixtures shall include cost of installation of control gear box wherever applicable.

A) Cost of supply and installation of necessary hardware shall be included in the unit rates quoted for installation of fixtures.

B) Fixing the newly supplied electrical fittings in position, including making end connections wherever required with electrical fittings.

C) Supplying and laying of cable, gland shall be paid under separate item.

Ceiling rose

A ceiling rose shall not be used on circuit the voltage of which normally exceeds 250V. Only one flexible cord shall be connected to a ceiling rose. Specially designed ceiling roses shall be used for multiple pendants. A ceiling rose shall not embody fuse terminal as an integral part of it.

Lamp holders

The standard constructional feature of manufacturers (ISI approved) of lamp holders is acceptable. Where the lamp holders are part of light fixtures the holders shall be suitable for the type of lamps used.

Fittings

The type of fittings shall be as specified in BOQ of tender documents.

The contractors shall supply the specified model and make of the fittings. The standard constructional features of specified make and model as given in the tender document are acceptable.

Where conductors are required to be drawn through tube or channel leading to the fitting, the tube or channel must be free from sharp angles or projecting edge, and of such size as will enable them to be wired with the conductors used for the final circuit without removing the braiding or sheathing. As far as possible all such tubes or channels should be of sufficient size to permit looping back.

Pendants in verandahs and similar situations exposed to wind shall be of fixed rod type.

Fittings using discharge lamps shall be complete with power factor correction capacitors, either integrally or externally. An earth terminal with suitable marking shall be provided for each fitting for discharge lamps.

Fittings shall be installed such that the lamp is at a height specified in approved drawings or as directed by the engineer-in-charge.

Copper chokes of fluorescent tube light fittings shall be of super low loss type (not more than 5.5 watts) or as specified in BOQ.

Attachement of fittings and accessories

A) Conduit wiring system

SIGNATURE OF TENDERER
SEAL



All accessories like switches, socket outlets, call bell pushes and regulators shall be fixed in flush pattern inside the switch/regulator boxes. Accessories like ceiling roses, brackets, batten holders, stiff pendants, etc. Shall be fixed on metal outlet boxes.

Brass screws shall be used to fix the accessories to their bases.

The switch box/ regulator box shall normally be mounted with their bottom 1.25m from floor level, unless otherwise directed by the engineer-in-charge.

B) Fixing to walls and ceiling

PVC sleeves/dash fasteners should normally be used for fixing to walls or ceiling.

Plugging of walls or ceiling can be done in a better way where neatness is the first consideration. In all such cases, an approved type of asbestos or fiber fixing plug (Rawl or phil plug) with correct size of tools shall be used and done in a workmanlike manner.

Fluorescent Luminaires

Decorative fluorescent fittings shall be provided with mounting/housing channel cum reflectors of CRCA sheet steel. Stove enamelled diffusers or louvers shall be translucent white polystyrene. The reflectors shall be made of CRCA sheet steel / aluminium / silvered glass / chromium plated sheet copper as required. The CONTRACTOR shall supply & install approved make and type of luminaries as per the drawing & manufacturer's recommendation. All luminaries shall be tested and to be repaired if not working and shown to IOC representative before handing over.

2.1 ELECTRICAL INSTALLATION (Surface mounted 2'x2' florescent lamp with Parabolic mirror longer)

2.1.1 3x18W (2'x2') surface type florescent lamp c/w fitting.

**2.2 ELECTRICAL INSTALLATION
(fluorescent lamp c/w prismatic diffuser)**

2.2.1 1x36W fluorescent lamp c/w fitting.

2.2.2 1x18W fluorescent lamp c/w fitting.

3 ELECTRICAL INSTALLATION (FANS)

3.1 ELECTRICAL INSTALLATION (CEILING FAN)

Ceiling fans including their suspension shall conform to relevant Indian standards.

Any additional hardware items required for installation of ceiling fans including fan hooks/clamps as specified below, shall be provided as specified in BOQ as a separate item.

All ceiling fans shall be wired to ceiling roses or to special connector boxes, and suspended from hooks or shackles, with insulators between hooks and suspension rods. There shall be no joint in the suspension rod.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
170 of
225**

For wooden or steel joists and beams, the suspension shall consist of ms flat of size not less than 40 mm x 6mm, secured on the sides of the joists or beams by means of two coach screws of size not less than 5 cm for each flat. Where there is space above the beam, a through-bolt of size not less than 1.5cm dia shall be placed above the beam from which the flats are suspended. In the latter case, the flats shall be secured from movements by means of another bolt and nut at the bottom of the beam. A hook consisting of ms rod of size not less than 1.5 cm dia shall be inserted between the ms flat through oval holes on their sides. Alternatively, the flats may be bent inwards to hold tightly between them by means of a bolt and nut, a hook of 'S' form.

In the case of 'I' beams, flats shall be shaped suitably to catch the flanges and shall be held together by means of a long bolt and nut.

For concrete roofs, a 12mm dia. MS rod in the shape of 'U' with their vertical legs bent horizontally at the top at least 19cm on either side, and bound to the top reinforcement of the roof shall be used.

In buildings with concrete roofs having a low ceiling height, where the fan clamp mentioned under sub clause (vi) above cannot be used, or wherever specified, recessed type fan clamp inside a metallic box shall be used. The metallic box shall suitably be covered with 3mm thick phenolic laminated sheet.

Canopies on top of suspension rod shall effectively hide the suspension.

The leading in wire shall be of copper and nominal cross sectional area not less than 1.5 sq. Mm and shall be protected from abrasion.

All ceiling fans shall be hung at a height as directed by the engineer –in charge.

In the case of measurement of extra down rod for ceiling fan including wiring, the same shall be measured in units of 10cm. Any length less than 5 cm shall be ignored.

The wiring of extra down rod shall be paid as supplying and drawing cable in existing conduit.

Regulators

The metallic body of regulators of ceiling fans/exhaust fans shall be connected to earth by protective conductor

3.1.1 24" dia ceiling fan with wiring.

3.1.2 36" dia ceiling fan with wiring.

3.1.3 48" dia ceiling fan with wiring.

3.2 ELECTRICAL INSTALLATION (PROPELLER FAN)

EXHAUST FANS:

Exhaust fans shall conform to relevant Indian standards.

Exhaust fans shall be erected at the places indicated by the engineer-in-charge. For fixing an exhaust fan, a circular hole shall be provided in the wall to suit the size of the frame, which shall be fixed by means of rag bolts embedded in the wall. The exhaust fan shall be connected to the

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
171 of
225**

exhaust fan point, which shall be wired as near to the hole as possible, by means of a flexible cord, care being taken to see that the blades rotate in the proper direction.

3.2.1 10" dia Wall Mounted Light Duty 1400 rpm Exhaust Fan

4 ELECTRICAL INSTALLATON (Cetrifugal Water Pumps)

- 4.1 0.5 HP Centrifugal Water Pum with floater witch & wiring**
- 4.2 0.75 HP Centrifugal Water Pum with floater witch & wiring**
- 4.3 1.0 HP Centrifugal Water Pum with floater witch & wiring**

5 ELECTRICAL INSTALLATON (Canopy Lights -3X36W CFL Fitting)

- 5.1 ELECTRICAL INSTALLATON (18W CFL Spot Light c/w Fitting)**
 - 5.1.1 60W CFL spot lamp fitting**
- 5.2 ELECTRICAL INSTALLATON (Canopy Lights -3X36W CFL Fitting)**

CANOPY LIGHT FITTINGS

Canopy mounted fitting shall be with CFL lamps. This fittings shall be with control gears and all other accessories. The CONTRACTOR shall supply & install approved make and type of luminaries as per the drawing & manufacturer's recommendation. All luminaries shall be tested and to be repaired if not working and shown to IOC representative before handing over.

SUPPLY AND FIXING OF CFL LUMINAIRES UNDER CANOPY WITH 3x36 W CFL LAMP

Supply and fixing of canopy mounted CFL luminaire with 3x36 W CFL including all accessories such as control gear, fixtures etc under canopy. This fitting shall be Clean Room Luminaires with high luminance levels. This fittings are available in Top opening /bottom opening and also with toughened glass (IP 65 version). This fitting shall be suitable for 3x36W PL- L Lamps and shall be of Philips FBS 300/336 P5 HPF/Wipro WIP 43336 SGW / Crompton CRFW 12336 / Bajaj BPRF 336 C LHD

- 4.4 Sup & Inst of Canopy Lights (BAJAJ Make), (Model No BPRF 336 C LHD as per Bajaj Catalogue).**
- 4.5 Sup & Inst of Canopy Lights (WIPRO Make), (Model No BGEST 250W MH IP66 FFG as per WIPRO Catalogue).**
- 4.6 Sup & Inst of Canopy Lights (PHILLIPS Make) (Model No BGEST 250W MH IP66 FFG as per PHILIPS Catalogue),.**
- 4.7 Installation of LIOC supplied Canopy Lights.**

5 ELECTRICAL INSTALLATON (Yard Light)

Providing point wiring for yard light, flood lights:

Providing wiring for yard light/ flood light poles from junction box to fixtures using 3 core/3 run 1.5 sq.mm flexible copper conductor cable including interconnections etc as required complete.

Scope of work under this item includes supply and installation of cables required between LDB and junction box mounted on yard light pole/flood lighting tower and also between junction box mounted on food light tower to metal enclosed control gear box located near flood light fixture, supply and installation of all the termination accessories, termination, testing and commissioning of cables. Contractor's scope of work also includes excavation, preparation of riddled soil bedding.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
172 of
225**

Supply and installation of protective covers over the cable, backfilling, ramming. Supply and installation of route markers, supply and installation of pipes for road crossing, supply and installation of necessary cleating arrangement for cabling on flood light tower, supply of labour, supervision, welding equipment, all tools and tackles and testing equipment as required. Earthing of street light pole/ flood light tower lighting fixtures, etc. is included under point wiring.

OCTAGONAL YARD LIGHT POLES

The yard light pole for the retail outlets shall be of tapered octagonal construction in single section made out of 3mm thick steel as per BSEN 10025 grade S355 or equivalent and hot dip galvanized with single dip process and as per Drawings Nos. The pole should be longitudinally welded (no circumferential welds are permitted) and uniformly tapered from the base to the top.

The pole should be designed as per BS 5649 and for a wind speed upto 160 km per hour at a height of 10 mtr above ground. The material for brackets for mounting the light fitting, base plate, flange plate etc. Should confirm to IS 2062. The pole should have concealed space for mounting the connector for looping of cables and MCB for switching on/ off the lights.

The poles shall be supplied in the above ground height of 5 m, 6 m and 7 m.

The light fittings to be mounted on the bracket in the above size of poles shall be as under –

- | | | |
|---|---------------|---|
| 1 | | Philips SRP 501/150 with 1x150 W MH |
| . | 5 m high pole | lamp or BAJAJ BGEST 150W MH IP 65 with 150 W MH lamp. |
| 1 | | |
| 2 | 6 m high pole | Philips SRP 501/150 with 1x150 W MH |
| . | | lamp or BAJAJ BGEST 150MH IP 65 with 150 W MH lamp. |
| 3 | 7 m high pole | Philips SRP 501/150 with 1x150 W MH |
| . | | lamp or BAJAJ BGEST 150MH IP 65 with 150 W MH lamp. |

Meter high galvanised Octagonal pole with top 70mm (Across/Face), bottom 130mm (Across/Face) made up of 3 mm thick HT plate having a base plate of size 220 x 220 x 12 mm with single arm 1500mm long bracket arm made up of 48 O.D. pipe with EN 8 grade M16x600 mm J type galvanised foundation bolts and anchor plate on suitable concrete foundation as per standard drawings enclosed herein(Civil & Electrical works shall be paid separately) having fixing arrangement for mounting 2 Nos. of Metal halide luminaries (on opposite sides)

Meter high galvanised Octagonal pole with top 70mm (Across/Face), bottom 130mm (Across Face), made up of 3mm thick HT plate having a base plate of size 220 x 220 x 12 mm with single arm 1500mm long bracket arm made up of 48 O.D. pipe with EN 8 grade M20x700 mm J type galvanised foundation bolts and anchor plate on suitable concrete foundation as per standard drawings enclosed herein (Civil & Electrical works shall be paid separately) having fixing arrangement for mounting 2 Nos. of Metal halide luminaries (on opposite sides)

Meter high galvanised Octagonal pole with top 90mm (Across Face), bottom 155mm (Across/Face), made up of 3mm thick HT plate having a base plate of size 260 x 260 x 16 mm

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
173 of
225**

with single arm 1500mm long bracket arm made up of 48 O.D. pipe with EN 8 grade M24x750 mm J type galvanised foundation bolts and anchor plate on suitable concrete foundation as per standard drawings enclosed herein (Civil & Electrical works shall be paid separately) having fixing arrangement for mounting 2 Nos. of Metal halide luminaries (on opposite sides)

- 5.1 ELECTRICAL INSTALLATION (Yard Light- Hexagonal Pole)
 - 5.1.1 Sup & Inst of Yard light pole including RCC base (BAJAJ Make).
 - 5.1.2 Sup & Inst of Yard light pole including RCC base (WIPRO Make).
 - 5.1.3 Sup & Inst of Yard light pole including RCC base (Galva Pole Make).

- 5.2 ELECTRICAL INSTALLATION (Yard Light - 100W MHL Lamp c/w Fitting)

METAL HALIDE YARD LIGHT FITTINGS

The luminaire shall be suitable for LED Light upto 400 Lux. The control gear accessories shall be mounted integral with the luminaire.

The luminaires may be with sheet steel / cast aluminium enclosure, wide angle distribution type polished reflector, acrylic cover and wire guard complete with neoprene gaskets, mounting bracket etc.

All luminaires used with metal halide lamps shall be of enclosed type.

The fixtures shall be totally enclosed with gaskets to prevent ingress of dust, moisture and insects inside the fixture. They shall be of outdoor weatherproof type.

All external hardware such as bolts, and screws, toggle lever, hinge pin etc. Shall be stainless steel.

Control gear box can be integral or supplied separately suitable for mounting on the pole or structure.

CDMT (Ceramic Discharge Metal Halide) lamps is a new version in yard lighting.

Supply and fixing of Yard Light luminaire with 100W metal halide lamp including all accessories such as control gear, fixtures etc on poles. (Pole shall be measured separately). This fitting shall be with pressure die cast aluminium housing having POT optics reflector and heat resistant toughened glass cover

- 5.3 ELECTRICAL INSTALLATION (LIOC supplied Yard Light Pole c/w fitting)

ERECTION OF COMPANY SUPPLIED YARD LIGHT POLES

This item includes taking delivery of the poles from Clients stores and fixing of the same above RCC foundation as per the drawing No

- 5.3.1 Installation of LIOC supplied Yard light pole c/w fitting.

- 6 ELECTRICAL INSTALLATION (MCB DB)
MCB DISTRIBUTION BOARDS

The complete board shall be factory fabricated and ready for installation at site.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
174 of
225**

The board shall be of wall mounted, cubical type construction, fabricated out of 1.6 mm thick sheet steel, with stove enameled paint finish.

The board shall also be provided with a loose wire ms box with front cover as a compartment for the complete width and depth of the board and of minimum height of 125mm in case of TPN DB's and 100mm in case of SPN DB's. Loose wire box shall be a part of MCB DB item and hence no payment will be made separately.

The distribution board shall be of double door type and such a board shall have an inner and outer cover. The inner cover shall be made of 1.6 mm thick sheet steel with screws. The outer cover shall be of hinged type made of 1.6mm thick sheet steel. Only the knobs of the MCBS shall protrude out of the inner cover through openings neatly machine made for the purpose.

Knock out holes at the bottom, and detachable plate with knock out holes at the top of the board shall be provided.

The board shall be complete with the following accessories: -

- (a) 200 A copper busbar(s).
- (b) Neutral link.
- (c) Common earth bar.
- (d) Din bar for mounting MCBS.

The standard constructional features of manufacturer for MCBDB is acceptable except for the thickness of sheet, provision of double door, bus bar capacity and loose wire box which shall be as specified.

Switch boards- application and types

- A) Switch board locations – as per approved drawings
- B) Cubicle type switchboards

The cubical type switchboard shall conform to the specifications for L.T panel.

Switch board installation

- (i) Unless and otherwise specified the distribution boards shall be installed so that its bottom is not less than 1.25 Mts from the floor level or as approved by the Engineer-in-charge
- (ii) Switchboard inside a residential quarter shall be installed such that the operating knob/handle of the in-comer is at height of about 2 mts.
- (iii) Cubicle board shall be installed by suitable foundation bolts grouted in floor/wall. Where cubicle boards are placed over the cable trench the panel shall be placed over a formed channel section, duly grouted as required. No extra cost for the channel and its grouting shall be paid separately.
- (iv) There shall be a clear distance of 1m in front of the switchboards. The space behind the switchboards shall be either less than 20 cm or more than 75 cm. If there are any attachments or bare connections at the back of the switchboard, rule 51 c of the Indian electricity rules shall apply.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
175 of
225

(v) The connections between the switchgear mounting and the outgoing cable upto the wall shall be enclosed in a protection pipe.

(vi) Where it is required to terminate a number of conduits on a fixed board or cubicle board, it may be convenient to provide a suitable ms adopter box for the purpose. Such boxes shall be provided with the prior approval of the engineer-in-charge and this will be paid for separately.

(vii) All wires to the boards shall be bushed at the entries to avoid damage to insulation.

(viii) No apparatus shall project beyond any edge of the panel.

(ix) All unused holes in the boards and in the mountings shall be plugged suitable to avoid entry of insects.

Wiring of switch boards and distribution boards

(i) All connections between pieces of apparatus, and terminals on a board shall be neatly arranged in a definite sequence, following the arrangement of the apparatus mounted thereon, avoiding unnecessary crossings.

(ii) Cables and wiring shall be connected to terminals either by crimped lugs or thimbles.

(iii) The incoming and outgoing cables shall be neatly bunched / clamped such that the doors shall be capable of swinging as required.

(iv) Where a board has more than one switchgear, each such switchgear shall be marked to indicate which section of the installation it controls. Where there is more than one main switch board in the building, each such switch board shall be marked to indicate which section of the installation and building it controls.

(v) All distribution boards shall be marked "L" for lighting or 'P' for power, and 'E' for essential 'NE' for non-essential as the case may be.

(vi) When a board is connected to a voltage higher than 250v, all the terminals or leads of the apparatus mounted on it shall be marked in the following colours to indicate the different poles or phases to which the apparatus or its different terminals may have been connected.

The lighting and power MCBDB 1.6 mm thick ms sheet steel enclosure shall be provided in RO/JRO. The relevant capacity of MCB, and RCBO (MCB+ ELCB) approved makes shall be provided as per IS: 8828-1996. The short circuit breaking capacity of MCB is 10 KA. The DP MCB shall be connected to pump and power load as per IS: 8828 - 1996.

11.1 Supply and installation of MCB distribution board with all accessories and Wiring having Double door without incoming isolator and MCBs – 8 Way TPN.

7 ELECTRICAL INSTALLATION (MV PANEL)

PANEL BOARDS: (Medium voltage panel board)

A) The SLS & British Standards complied with shall include the following :

Item

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
176 of
225**

Aluminium busbars and interconnections
Busbars and connectors
Control switches and push buttons
Control transformers
Copper
Current transformers
Danger notice
Electrical enclosures
Fuses
Potential transformers
Fuse switches and switches
Indicating lamps
Maintainability
Meters – indicating
Meters - recording

Relays

In case of all the above publications, references shall be made to the latest versions as amended and revised upto date.

b. Approval and certification

The boards shall be manufactured through CPRI approved parties only. The CPRI certificate shall be produced prior to manufacture of the unit.

c. Approval by Electrical Inspectorate

The boards shall be manufactured to comply with the requirements of the Electrical Inspectorate of the State. This implies that the manufacturer shall be aware of the latest standards and practice stipulated by the Electrical Inspectorate of state with respect to switchboards. .

d. Drawings

The supplier shall prepare and furnish to the Client/Architect/Consultant detailed drawings of the panel boards and its parts with all the required information within fifteen days of the letter of intent. The manufacture shall be taken up only after receipt of the approved drawings from the Client/Architect/Consultant. The Suppliers shall take action in this matter in such a manner that the process of submission of drawings and details and approval by Client/Architect/Consultant are complete in time to adhere to the stipulated delivery period.

e. Tests

All standard tests as specified in relevant Indian Standards shall be carried out by the manufacturer on the switchboard and its parts. These tests are to be carried out in the presence of the representative of the Client/Architect/Consultant preferably and detailed test reports are to be furnished to the Client/Architect/Consultant.

Results of all the tests shall be recorded and furnished to the Client/Architect/Consultant. Test certificates of breakers, relays, etc. used in the board shall be furnished.

f. General construction

The board shall be of sheet-steel, totally enclosed, dust tight, vermin-proof, flush dead front, modular and fully compartmentalized construction. The different breakers and switches shall be

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
177 of
225**

housed in separate and independent totally enclosed compartments. Each compartment shall be self-sufficient with all the components and an independently interlocked door with padlocking facility. The board shall be easily extensible at both ends.

The board shall be complete with an integral base framework of adequate design and construction so that the board can be directly mounted using suitable foundation/ anchoring bolts.

It shall be suitable for functioning efficiently and continuously under the service conditions specified.

Adequate provision shall be made for easy access to all internal components of the board for inspection, testing, maintenance, repairs and replacements. All name plates of internal components shall be placed in such a manner that they can be read from outside when the cover/door of the compartment is opened.

Hylam shall not be used in the board for any purpose. In place of hylam, FRP sheet shall be used. Minimum thickness of FRP shall be 3mm.

g. Enclosure

The enclosure of the boards shall be made of cold rolled sheet steel. The enclosure shall be of floor or wall-mounting type construction as specified. When floor-mounted, it shall be of free-standing and self-supporting type construction. When wall-mounted, it may be surface-mounting type or recessed type as specified.

The enclosure shall be so designed and constructed as to prevent the entry of dust, water, insects and vermin. All doors, detachable covers, plates etc. shall be provided with effective gaskets. The covers shall be provided with fasteners which would ensure tight closing of the covers by properly compressing the gaskets. Ventilating louvers, if provided, shall be provided with fine brass wire mesh screens.

The enclosures may be of double-front construction where access will be available into the board both from front and rear or of single-front type where there will be access only from the front of the board and the back will be completely closed. The type of access shall be as specified.

Every compartment in the board shall be totally segregated from other compartments by sheet steel enclosure on all sides with insulating bushes for entry and exit of power and control wiring and interconnections.

No live component shall be mounted on the door of the compartment.
Suitably inscribed plastic/bakelite designation labels shall be fixed on the compartment doors.

Busbar chambers shall be provided with screwed covers. Cable alleys, meter and relay compartments and switchgear compartments shall be provided with hinged doors which shall be closed tight by means of captive screws with moulded plastic knobs. All the hinges shall be of concealed type.

The covers and doors shall be properly stiffened by means of ribs or other stiffeners against wobbling.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
178 of
225**

Wherever hinged doors are provided and live parts will become accessible on opening of the hinged doors, adequate shrouding shall be provided using FRP barriers to prevent unintentional contact with the live parts.

The minimum thickness of cold-rolled sheet steel used for the fabrication of the board shall be of 2.5mm. The folded sections forming the base and vertical framework shall be fabricated out of cold-rolled sheet steel having a minimum thickness of 3mm. Comparatively large covers and doors shall be fabricated using 3mm thick sheet steel.

The structure of the enclosure shall be strong and rigid and shall not suffer any distortion during transport, handling or erection. The different parts of the enclosure shall be able to withstand without any shake or vibration, the static and dynamic loading of various equipment installed in the enclosure. The board shall be stable under all the required conditions of loading and operation. Adequate lifting hooks shall be provided.

Boltholes shall be provided in the bottom framework for the foundation bolts. In case of wall-mounting boards, holes shall be provided for fixing bolts either on the back plate of the board or on external lugs. The required foundation/anchor bolts, nuts and washers shall be supplied along with the boards.

The height of enclosure shall be the same throughout the board.

The metal work of the enclosure shall be fabricated to good quality finish with the surface level and smooth without any flaw. The corners shall be rounded.

The metal work of the enclosure shall be fabricated in a shop with adequate facilities such as power-operated guillotine shears, press brakes, presses, powder-coating plant, etc. The metalwork shall be powder coated after treatment.

h. Busbars

The busbars shall be arranged in horizontal and vertical formations as required. The busbars shall be air insulated. Where supply to outgoing feeder controls is tapped from vertical busbars, outgoing feeder controls shall be installed only on one side of the vertical busbars and not on both sides. In other words, every vertical multi-tier module of outgoing feeder controls shall have its own individual set of vertical busbars and from this set of vertical busbars supply shall not be tapped to another vertical module of outgoing feeder controls.

Busbars and covers of the busbar enclosure shall be so arranged to provide easy access for inspection, testing, maintenance, repairs and replacements required to be carried out inside the busbar enclosure. Facility shall be provided to comfortably check the tightness of busbar connections using tools of standard sizes.

The busbars and busbar chamber shall be extensible on both sides of the boards so that the boards can be extended on either side.

For busbars exceeding 2000mm length, allowance for expansion shall be provided by means of well-designed and installed flexible expansion joints.

All busbars shall be of high conductivity electrical grade aluminium extrusions of reputed manufacture. The main horizontal busbars shall be of the same section throughout the length of the board. Their current rating shall be equal to the full rated current of the incoming breaker/switch. The current rating of the neutral bar shall be 50% of that of the phase busbar.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
179 of
225**

The branch busbars shall have current rating equal to the total of the full rated currents of all the outgoing breakers and switches connected to them provided that

The current rating need not be higher than the main bus bars, and that The bus bars will have short-circuit rating equal to that of the main busbars.

The size of the main and branch busbars shall be got approved by the Client/Architect/Consultant.

The maximum current rating allowable for aluminium busbars is 0.8 Amps/ sq.mm. Any derating required by the Client/Architect/Consultant or the Electrical Inspectorate shall be taken into consideration while fixing the sizes of the busbars.

The boards shall be provided with triple pole or triple pole and neutral busbars as specified. Busbar joints shall be of bolted type. Only cadmium or zinc passivated high -tensile steel bolts, nuts and spring washers shall be used.

Busbars shall be given colour coding. The busbars shall be provided with heat shrinking PVC sleeves throughout their length. Where it is not possible to provide PVC sleeving, moulded FRP shrouding shall be provided. No hylam is permitted.

The cross-sectional area of the busbars and the supports provided for the busbars shall be capable of withstanding without damage the electromagnetic and thermal effects of short-circuit current corresponding to 25kA at 415V. Only moulded SMC supports shall be used for supporting the busbars. Busbars to withstand 25 kA shall be supported at intervals not exceeding 500mm and the minimum thickness of SMC finger type support shall be 25mm.

Where the busbars of one phase or neutral consist of more than one conductor, the space provided between the parallel conductors shall be equal to the thickness of the single conductor. Spacers of the same thickness shall be provided between the parallel conductors at intervals not exceeding 600mm.

The ratio of cross-sectional areas of busbars to busbars enclosure shall be as approved by the Electrical Inspectorate.

i. Cable Alleys

The cable alley shall be spacious enough to accommodate all the cables to be installed inside it and also to facilitate their proper routing, clamping, shaping and termination without causing any strain to the cables and terminations. The space shall be adequate to facilitate easy working on any set of terminations without disturbing the shrouding over other terminals in the cable way. Cable alley shall be provided with hinged doors. The cable alleys shall have detachable glanding plates at the top and bottom. The glanding plates shall have adequate space to comfortably accommodate all the cable glands that would be installed on it. The glands shall be so spaced that it will be possible to work on the different cable terminations without any difficulty.

The terminals in the cable alley shall be shrouded so that it should be safely possible to work on any set of terminals after switching off the concerned feeder while the other terminals in the cable alley remain live. FRP sheets or moulded components shall be used for the shrouding. No hylam shall be used. The shrouding shall be designed to ensure easy fixing and removing. The shrouding shall totally prevent the possibility of any accidental contact with the live parts shrouded.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
180 of
225**

The terminals in the cable alley shall be suitable to accept the maximum size of cable that may be used for the feeder. The terminals shall be adequately and conspicuously labelled for identification with its corresponding switch/ control compartment.

Power and control cable termination facilities shall be well segregated. Segregation facility shall be provided for all cables working at different voltage systems.

The cable alley shall be effectively segregated from all the surrounding compartments housing live parts.

Facility shall be provided for termination of the cables both at the top and bottom of the cable alley if cable entry is not specified. The direction of cable entry shall be got verified from the Client/Architect/Consultant before fabrication of the board.

The switchboards shall be supplied without cable glands and sockets unless otherwise specified.

j. Clearances

The minimum clearances between conductors and between conductors and earthed metal shall be as follows :

Between phases	-	25mm
Between phase and neutral	-	25mm
Between phase and earth	-	25mm
Between neutral and earth	-	20mm

k. Operating heights

The maximum height of any operating handle/knob/button shall not be more than 1800mm measured from the bottom of the board.

The maximum height of the panel shall not exceed 2200mm.

As far as possible all the indicating instruments shall be mounted at a height of not more than 1800mm measured from the bottom of the board.

l. Switches and Fuse Switches:

All switches and fuse switches used in the boards shall be of air-break, heavy duty, double-break, load-break type with quick break and quick make features.

They shall be of front operated type. The fuse switches shall be capable of withstanding the fault current which would flow through them without damage.

Switch handle shall have the facility to be locked in closed and open positions of the switch.

The switches and fuse switches shall be installed in the compartments in such a manner that their live parts will not be accessible during normal working inside the compartment. The front door of every compartment housing a switch or fuse switch shall be interlocked with the switch/fuse switch in such a manner that the door can be opened only after the switch is opened and that the switch/fuse switch cannot be closed when the door is in open position. Parts of the switch/ fuse switch which remain live even after the switch is opened shall be effectively shrouded against accidental contact. Such shrouds shall be suitably marked to indicate that they cover live parts. Only FRP sheets or moulded components shall be used for such shrouding. No

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
181 of
225**

hylam is permitted. The shrouding sheets shall have enough thickness and rigidly so that it will not be flexible under normal pressures encountered during assembly, erection, operation, inspection and maintenance.

The interconnection between busbars and switches/fuse switches shall be kept as short as possible. The interconnecting conductors shall be rated for the full current rating of the switch/fuse switch. The interconnecting conductors shall be well-insulated, well-segregated and well-supported. The inter connectors shall be mechanically rigid.

Fuses shall be of HRC cartridge type, mounted on plug-in type fuse bases having a short-circuit rating of not less than 80kA. Fuses shall be provided with visible operation indicators to show that they have operated. All accessible live connections shall be adequately shrouded, and it shall be possible to replace the fuses when the circuit alive without danger of contact with live parts. Insulated fuse pulling handle shall be supplied with each board.

Sufficient and accurate indication shall be provided on the door of the compartment to know whether the switch/fuse switch is in open or closed position.

Rotary cam type switches shall not be used in the boards except for control and indication circuits.

The ratings of the fuses shall be as per the actual requirements. The ratings of fuse links shall be obtained from the Client/Architect/Consultant before supplies are effected.

m. Current transformers

The burden of the current transformers provided shall be adequate for the meters and protective devices connected to these.

Facility for short-circuiting and grounding the current transformer secondaries shall be provided at the terminal blocks through proper links. Links shall also be provided to carryout current and phase angle measurement tests with the current transformers in service.

The voltage rating of the current transformers shall be 1000V. Their short circuit withstand capacity shall be 31MVA at 415V. The secondary rating of current transformers shall be 5A unless otherwise specified.

Metering current transformers shall have an accuracy of Class 1 and protective current transformers shall be of class 5P10 unless otherwise specified.

n. Meters

All meters shall be of flush-mounted type.

Ammeters and voltmeters shall be of moving iron type having 144mm square, 90 degree scale. Dials shall be white and the markings shall be black.

Ammeters measuring upto 10A shall be directly connected while those measuring above 10A shall be connected through suitable current transformers. Unless otherwise specified, the meters shall be rated for current transformers with secondary current of 5A.

Voltmeters shall be provided with selector switches and protected with HRC fuses.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
182 of
225**

Watt meters and power factor meters shall be of electrodynamic type with current and potential coils. They shall be of 96 Sqmm square, flush-mounting type. The range of the power factor meter shall be from 0.5 lagging to 0.5 leading through unity power factor.

Integrating meters such as trivector meters, energy meters, etc. shall conform to IEC-170.

o. Control and Selector switches

Control and Selector switches shall be of rotary type. They shall have escutcheon plates with the operating positions marked. Control switches shall have momentary contacts while selector switches shall have stay-put contacts. They shall be suitable to operate at the required voltage and current ratings. The number of contacts and the switching pattern shall conform to the functional requirements.

p. Push Buttons

Each push button shall have 2 nos. "NO" and 2 nos. "NC" contacts. The push buttons shall be provided with legend plates indicating their functions.

q. Indicating lamps

Indicating lamps shall be of low loss LED type. They shall be of suitable voltage rating. They shall be provided with legend plates to indicate their functions.

r. Control Wiring

All control wiring shall be carried out using 1100V grade, single core PVC wires with fine-stranded copper conductors.

Following shall be the minimum sizes of copper conductor for control cables:

Voltage circuits	-	2.5 Sq.mm
Current transformer circuit	-	2.5 Sq.mm

The control wiring shall be segregated from wiring of differing voltages. Voltage circuits and current transformer circuits shall be segregated.

The wiring shall be carried out using PVC wiring channels of required sizes. Where channels cannot be used, the wiring shall be neatly bunched and routed. Along the route, the wiring shall be supported at required intervals.

Adequate numbering by ferrules shall be provided for easy identification of the wires.

s. Earthing

An earth bus of copper conductor shall be run across the full length of the board to which all the non-current carrying metal parts of the board shall be effectively earthed. The ends of the earth bus shall have facility at both ends for being connected to the external earthing system. Such points of connection on the earth bus shall be easily accessible. The size of the copper earth bus shall be 25 x 3mm unless otherwise specified.

Labels / Lettering (Painting)

The board shall be labelled using plastic/bakelite engraved designation label. 415V danger label as per relevant standard specification shall be affixed on the board.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
183 of
225**

The label bearing name of the board shall have a minimum width of 40mm. Every compartment shall be labelled for identification using labels of minimum width of 20mm. All indicating lamps, control switches, push buttons, etc. shall also be labelled for identification. Sizes, type and number of cables connected to each compartment shall also be mentioned in the label on the respective compartment.

All components such as current transformers, meters, contactors, etc. mounted inside the board shall be mounted in such a manner that their name plates are easily visible for reading in the installed position.

u. Safety

All live parts / terminals to be totally shrouded. Finger touch proof wiring to be provided. Danger boards, Bus bar covers to be provided.

v. Maintainability The board shall be so designed and constructed that it shall be possible to carryout all the routine inspection, maintenance, repairs and replacement jobs easily and expeditiously so that down-time is reduced to the minimum. All replaceable parts shall be easily accessible for removal and replacement.

Particular attention shall be given to provide easy access for inspection, testing, maintenance, repairs and replacements of the following :

Busbars and connections on busbars

Busbars supports.

All points of interconnections.

All points of wiring terminations.

Setting dials of all relays and other controls.

Cable terminations.

Earthing connections.

Neutral links.

Current transformers.

Control transformers.

Fuses.

Coils such as under-voltage coil, shunt-trip coil, operating coils etc.,

Space heaters, lamps, thermostats, etc.,

All components inside the switchboard shall be so mounted that their name plates can be easily and clearly read just by opening the cover/door of the compartment concerned.

w. Operation and maintenance instructions

One set of following documents relating to all switchgear, protective devices and meters shall be supplied along with the board:

Technical details including wiring diagrams.

Inspection, testing and commissioning manuals.

Operation and maintenance instructions.

Spare parts catalogue.

x. Testing and commissioning

The CONTRACTOR shall at the price quoted make available the services of his competent and experienced personnel for testing and commissioning of the switchboards.

NOTE: Item also includes provision of heavy duty connectors (for all outgoing) at the bottom of the panel. All the outgoing from the MCB's must be prewired upto heavy duty connectors fixed on the front panel of cable alley with suitable rating of single core wires and all outgoing cables shall be connected to this heavy duty connector after glanding on the bottom of the panel. Panel

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
184 of
225**

must be mounted with a clear height of 300 mm from the FFL of the electrical room and this gap must be covered.

- 12.1 Supply, Installation, Testing and commissioning of MV PANEL BOARD suitable up to 60 KW connected load as described and specified above and as per attached drawings comprising of following.

S&I MV panel :

S&I MV panel board cubicle with floor mounting type with dust and vermin proof made of 1.6 mm thick CRCA sheet with busbar chamber, cable all accessories including with Bus bars & wiring
100 Amps 4 pole load break type change over switch - 1 NO
100 Amps TPN MCCB - 1 NO
40 Amps 4P MCB - 4 Nos
20 Amps TP MCB - 4 Nos
32 Amps TPN FSU - 3 Nos
25 Amps DP RCCB - 9 Nos.
6-30 Amps DP MCB -45 Nos
RYB Indication Lamps, Ammeters ,Voltmeters,selector switches, CTs, ELR, control fuses, control wiring, painting, M.S Channel, Supports etc

8 ELECTRICAL CABLING

CABLING & ALLIED WORKS – ARMOURED CABLES

This section covers the following:

- a) Power cables
- b) Control cables

Supplying and laying underground XLPE insulated PVC sheathed copper, aluminum conductor armoured 1.1KV grade cable of approved make as per IS: 7098(Part-I), through RCC hume pipe in RO and JRO. The cable shall be marked the "ISI mark" printed continuing entire length. (the rate of RCC hume pipe or cable trench with cover slabs or brick duct as required at site, earth work excavation, refilling etc., shall be paid under separate item of work, XLPE insulated cable is preferred over PVC insulated cable).

Power cables shall conform to the following requirements:

Power cables for use on 415 V system shall be of 1100 volt grade, aluminium conductor, XLPE insulated, PVC sheathed, armoured and overall PVC sheathed cable, strictly as per relevant IS specification. Unarmoured cable to be used only if specifically mentioned in schedule of requirements. Bi-metallic plate washers should be provided wherever cables, lugs, and switch terminals are of different materials. Cables and cable lugs should be of same material where ever possible.

The size of these cables shall be as specified in schedule of requirements or as per erection drawings. No aluminium conductor cable of size less than 4 sq.mm shall be used.

Control cables shall conform to the following requirements:

Control cables for use on 415 v system shall be HFFR (halogen free fire retardent) type 1100 volts grade, copper conductor, PVC insulated, PVC sheathed, armoured/ steel braided and overall PVC sheathed, strictly as per IS : 1554 (Part I) - 1988. Unarmoured cables to be used only if specifically

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
185 of
225**

mentioned in schedule of requirements. control cable carrying current should be black colour and voltage circuit shall be of grey colour and shall be segregated.

The size of these cables shall be as specified in schedule of requirements or as per erection drawing. No cable of size less than 1.5 sq.mm. Shall be used. Control wiring cable inside the panel board should be provided with ferrules for identification. Identification tags should be provided with each length of cable.

Storage of cables:

- (i) The cable drums shall be stored on a well drained, hard surface, so that the drums do not sink in the ground causing rot and damage to the cable drums. Paved surface is preferred, particularly for long term storage.
- (ii) The drums shall always be stored on their flanges, and not on their flat sides.
- (iii) Both ends of the cables should be properly sealed to prevent ingress/absorption of moisture by the insulation during storage.
- (iv) Protection from rain and sun is preferable for long-term storage for all types of cables. There should be enough ventilation between cable drums.
- (v) Damaged battens of drums etc. Should be replaced, as may be necessary.

Handling of cables:

- (i) When the cable drums have to be moved over short distances, they should be rolled in the direction of the arrow marked on the drum.
- (ii) For manual transportation over long distances, the drum should be mounted on cable drum wheels, strong enough to carry the weight of the drum, and pulled by means of ropes. Alternatively, they may be mounted on a trailer or on a suitable mechanical transport.
- (iii) For loading into and unloading from vehicles, a crane or a suitable lifting tackle should be used. Small sized cable drums can also be rolled down carefully on a suitable ramp or rails, for unloading, provided no damage is likely to be caused to the cable or to the drum.

Applicable standards: SLS and British standards shall be applicable for the following:

- 1. Specification for aluminium conductors/ copper conductors for insulated cables.
- 2. Specification for XLPE insulation and PVC sheath of electric cables.
- 3. Specification for mild steel wires, formed wires and tapes for armouring of cables.
- 4. PVC insulated cables for voltages upto 1100 V.
- 5. Specification for XLPE insulated PVC sheathed cables.
- 6. Recommended current ratings of cables.
- 7. Recommended short circuit ratings for high voltage PVC cables.
- 8. PVC insulated heavy duty electric cables for working voltages up to and including 1100v

Insulation of cables:

The thickness of insulation shall be on the basis of insulation material, voltage and conductor size conforming to the relevant standard specification. The cores shall be colour coded to IS specifications. The XLPE insulation & sheathing shall be of high quality.

Sheathing of cables:

The sheathing shall be PVC and shall be before and after the armouring, the thickness of the sheathing shall be based on the conductor size and overall diameter below the sheathing.

Armouring of cables:

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
186 of
225**

All multicore cables liable for mechanical damage shall be armoured.

Cables, when armoured, shall have galvanised steel wire (flat or round) for armouring.

Steel wire armouring is preferred where the cables are liable to tensile stresses in applications such as vertical runs, suspended on brackets or laid in soil that is likely to subside

The armouring for cables above 16 mm sq. Shall be galvanised steel strips and below with wire strips.

Laying of cables:

i) Cables as far as possible shall be laid in complete, uncut lengths from one termination to the other. Cables shall be neatly arranged in the trenches/trays in such a manner so that criss-crossing is avoided and final take off to the motor/switchgear is facilitated. Arrangement of cables within the trenches/trays shall be the responsibility of the CONTRACTOR. Cable routing between lined cable trench and equipment/motors shall be taken through GI pipe sleeves of adequate size. Pipe sleeves shall be laid at an angle of maximum 45 Degree to the trench wall. In case of larger dia cables i.e. 50mm and above adequately sized pipe with larger bend radius shall be provided for ease of drawing of cable or for replacement. In places where it is not possible, a smaller trench may be provided if approved by Engineer-in-charge. The cost of pipe sleeve / trench shall be paid extra under respective items.

ii) Directly buried cables shall be laid underground in excavated cable trenches where specified in layout drawings. Trenches shall be of sufficient depth and width for accommodation of all cables correctly spaced and arranged with a view of heat dissipation and economy of design.

iii) Minimum depth of buried cable trench shall be 750 mm for low voltage and 900 mm for H.V. Cables. The depth and the width of the trench shall vary depending upon the number of layers of cables as per Standard.

iv) Cables shall be laid in trenches as per standards.

As each row of cables is laid in place above and before covering with sand every cable shall be given an insulation test in the presence of Engineer-in-Charge \ owner. Any cable which proves defective shall be replaced before the next group of cables are laid. The test shall be done as and when as asked for by the Engineer in-charge.

v) All wall openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water inside building/lined trench.

vi) Cable shall be clamped on wall/column with necessary clamp using zinc coated /cadmium plated screws and nuts when the cable is run above ground level.

vii) The rate of Installation should be inclusive of Cable clamps, tags, Saddles, Spacer, Screws, Consumables etc. However the same excludes cable glands, cable lugs/sockets, cable trays/pipes, trenches, fabricated tray supports etc which will be measured and paid separately.

Testing of cables :

i) Before energizing, the insulation resistance of every circuit shall be measured from phase to phase and from phase to ground.

ii) Where splices or termination are required in circuits rated above 600 volts, measure insulation resistance of each length of cable before splicing and or/terminating. repeat measurement after splices and/or terminations are completed.

iii) Measure the insulation resistance of directly buried cable circuits before cable trenches are back filled. Repeat measurement after back filling.

iv) For cables upto 1.1 KV grade 1000 KV Megger and for H.V. cables 2.5 KV/5 KV Megger shall be used.

8.1 2.5mm² PVC earthing for canopy light.

8.2 4x6 mm² PVC Main wire from MSB to DBs .

8.3 4x4mm² PVC/SWA/XLPE CU Cable – Compressor.

SIGNATURE OF TENDERER

SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

**Page
187 of
225**

- 8.4 4x35mm² PVC/SWA/XLPE cable Gene/CEB meter.
8.5 4x 16mm² PVC main wire to DB'S from Main Panel.

9 ELECTRICAL CABLING (LAYED THROUGH HUME PIPE)

- 9.1 4x2.5 mm² PVC/SWA/XLPE CU cable for pump.
9.2 3x2.5mm² Armoured cable for canopy light.
9.3 3x1.5mm² Armoured cable for yard light.

10 EARTHING SYSTEM (FOR EARTH GRID)

EARTHING: EARTH PITS & EARTHING CONNECTION

This specification covers the requirements of supply, installation, testing and commissioning of earthing system as per BS Codes and standards

The earthing system installation work shall conform to the latest applicable electricity rules, all currently applicable standards, codes of practice, regulations ,safety codes of the locality where the installation is to be carried out as per drawings.

The entire earthing installation shall be in accordance with the drawings, specifications, and provisions of relevant standards. The entire installation shall fully comply with the Indian electricity rules and acts in force.

The scope includes the following :

A) Earth work in excavation upto a depth of minimum 3.75 meters or upto level of moist soil in all types of soil.

B) Supplying and laying of earth pipe and earthing conductor from main board/equipment to earth pit, conductor size 25x6 mm GI strip. The rate quoted is inclusive of GI strip for connection purpose. However GI strip from panel board upto the earthpit shall be measured & paid seperately.

C) Supplying and laying 3 m long 100 mm dia GI class B pipe with funneling arrangement as per requirement/order.

D) Supplying and spreading required capacity of charcoal and of common salt in the earthing pit.

E) Back filling the pit with excavated or imported earth, duly consolidated with water in 200mm thick layers and disposal of surplus earth to an un objected place.

F) Laying of earth conductors in outdoor areas, buried in ground, shall include excavation of earth upto 500 mm deep, laying of conductor, brazing/welding/jointing if required, of main grid conductor, joints as well as riser of length 500 mm above ground at required locations and then backfilling.

G) Interconnection of all the earth pits using 50x6 mm GI strip to make a earth grid to reduce the earth resistance of the system.

H) Connecting the earthing conductor with lighting and power main-circuit equipment.

**SIGNATURE OF TENDERER
SEAL**

 Lanka IOC	TENDER NO: LIOC/ ENG/ PT-03/ 2025-26	Page 188 of 225
	TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.	

The installation and maintenance of an effective low resistance earthing system is essential due to the following -

Efficiently dissipate heavy fault currents and electrical surges, both in magnitude and duration, to protect equipment being damaged so as to minimize down time, service interruption and replacement cost.

Provide a stable reference for electrical and RF circuits at the installation to minimize noise during normal operation.

Protection of personnel who work within the area from dangerous electric shock caused due to “step potential” or “touch potential”.

Characteristics of good Earthing system

Excellent electrical conductivity

Low resistance and electrical impedance.

Conductors of sufficient dimensions capable of withstanding high fault currents with no evidence of fusing or mechanical deterioration.

Lower earth resistance ensures that energy is dissipated into the ground in the safest possible manner.

Lower the earth circuit impedance, the more likely that high frequency lightning impulses will flow through the ground electrode path, in preference to any other path.

High corrosion resistance

The choice of the material for grounding conductors, electrodes and connections is vital as most of the grounding system will be buried in the earth mass for many years. hence, highly galvanised electrodes should be used to avoid corrosion.

Mechanically robust and reliable.

Location for Earth

Low lying areas close to the building or equipment are good for locating Earth Electrodes.

The location can be close to any existing water bodies or water points but not naturally well-drained.

Dry sand, lime stone, granite and any stony ground should be avoided.

Earthing electrode should not be installed on high bank or made-up soil.

Acceptable Earth Resistance value

The acceptable Earth Resistance at electrode terminal shall not be more than 2 Ohm.

Components of Earthing & Bonding system

The components of Earthing & Bonding system are-

Earth electrode, Earth enhancement material, Earth pit, Equi-potential earth busbar, connecting cable & tape/strip and all other associated accessories.

Design of Earthing & Bonding system

GI Electrode

- 1) Pipe in pipe / Strip in Pipe technology
- 2) Highly galvanised. Inner strip or pipe is galvanised to 250 microns and outer pipe is 100 microns.
- 3) Highly conductive mixture is poured inside the electrode so that inner strip or pipe will never corrode and provide lowest possible resistance.
- 4) Made of G.I.
- 5) ISI marked.
- 6) Weight of 40mm dia electrode is > 17.0 Kg, 50mm dia electrode is > 23.0Kg and 80mm dia electrode is > 45Kg.

Earth Enhancement material : (30Kg per electrode)

Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It

SIGNATURE OF TENDERER
SEAL

 Lanka IOC	TENDER NO: LIOC/ ENG/ PT-03/ 2025-26	Page 189 of 225
	TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.	

improves conductivity of the earth electrode and ground contact area. It shall have following characteristics-

- shall mainly consist of Graphite and Portland cement. Bentonite content shall be negligible.
- shall have high conductivity, improves earth's absorbing power and humidity retention capability.
- shall be non-corrosive in nature having low water solubility but highly hygroscopic.
- shall be suitable for installation in dry form or in a slurry form.
- shall not depend on the continuous presence of water to maintain its conductivity.
- shall be permanent & maintenance free and in its "set form", maintains constant earth resistance with time.
- shall be thermally stable between -100 C to +600 C ambient temperatures.
- shall not dissolve, decompose or leach out with time.
- shall not require periodic charging treatment nor replacement and maintenance.
- shall be suitable for any kind of electrode and all kinds of soils of different resistivity.
- shall not pollute the soil or local water table and meets environmental friendly requirements for landfill.
- shall not be explosive.
- shall not cause burns, irritation to eye, skin etc.

Backfill material

The excavated soil is suitable as a backfill but should be sieved to remove any large stones, plastic or debris and placed around the electrode taking care to ensure that it is well compacted. Material like sand, salt, coke breeze, cinders and ash shall not be used because of its acidic and corrosive nature.

Earth Pit

Construction of unit earth pit:

A hole of > 100mm dia shall be augured /dug to a depth of about 3.0 meters.

Sieved soil should be poured inside the hole for about 100mm and earth enhancing material thoroughly mixed with 6 times of water should be poured (around 5 litres in the pit). Now the earth electrode shall be placed into this hole.

Remaining earth enhancement material mixed with 6 times of water shall be filled into the augured/dug hole in slurry form and allowed to set. After the material gets set, the diameter of the composite structure (earth electrode + earth enhancement material) shall be of minimum 100mm dia covering entire length of the hole.

Top of the pit should be covered with normal sieved soil for about 50mm.

A GI strip of 25mmX6mm in case of 40mm dia rode and 32x6 in case of 50mm dia rode and 50x6 mm in case of 80mm dia rode shall be used for interconnections to the earth pits or to the MEBB (Main equipotential bus bar). All the joints between the GI strips or between the GI strip and earth electrode or GI strip to MEBB should be done by welding or Stainless steel nuts and bolts.

Earth pit shall be located as near to the MEBB in the equipment room as possible.

MEBB should be of size 450x50x6 mm and should be mounted on the wall and insulators are provided so that it should not touch the wall.

Construction of loop Earth by providing multiple earth pits

At certain locations, it may not be possible to achieve earth resistance of $\leq 20\Omega$ with one earth electrode /pit due to higher soil resistivity. In such cases, provision of loop earth consisting of more than one earth pit shall be done. The number of pits required shall be decided based on the resistance achieved for the earth pits already installed. The procedure mentioned above for one earth pit shall be repeated for other earth pits.

The distance between two successive earth electrodes shall be min. 3mtrs. and max. upto twice the length of the earth electrode i.e. 6 mtrs. approx.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
190 of
225**

These earth pits shall then be inter linked using 25X6 mm. GI strip to form a loop using exothermic welding technique.

The interconnecting tape shall be buried at depth not less than 500mm below the ground level. This interconnecting tape shall also be covered with earth enhancing compound. In such cases, 10Kg. earth enhancing compound is required for each interconnection of electrodes,i.e, for every 3m. 10Kg earth enhancing compound is required.

Measurement of Earth resistance

The earth resistance shall be measured at the Main Equi-potential Earth Busbar (MEEB) with all the earth pits interconnected using Fall of Potential method as per para 37 of IS: 3043.

Inspection Chamber

A 300X300X300 mm (inside dimension) concrete box with smooth cement plaster finish shall be provided on the top of the pit. A concrete lid, painted black, approx. 50 mm. thick with pulling hooks, shall be provided to cover the earth pit. In case of remote sites, the concrete pit of bricks can also be prepared and the cover of C.I. should be provided.

Care shall be taken regarding level of the floor surrounding the earth so that the electrode terminal is not too deep in the masonry or projecting out of it.

The contractor shall carry out the earthing of all equipment/panels/structures etc. As per relevant industry practices. All welding brazing equipment, necessary tools and testing equipment shall be furnished by the contractor.

All incidental hardware & consumables including associated works shall be in contractor's scope.

Testing the earthing continuity path with a meggar. The earth continuity conductor including metal conduits and metallic envelops of cable in all cases shall be tested for electrical resistance of the same, along with the earthing load but excluding any added resistance. Leakage measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm, wherever necessary increase the no. of earth pits.

Accordance with either the direct earthing system, the multiple earthed neutral system or the earth leakage circuit breaker system, in all case, the relevant provision of rules no.33 and 61 of Indian electricity rules-1956 shall be complied with.

Certificate for the earth test should also be submitted by the contractor to the corporation as per IE rules and regulations.

Earthing connection

A) All connections in the main earth conductors in earth/concrete and connection between main earthing conductor and earth leads shall be of welded/bolted type.

B) Connection between earth leads and earthing terminal provided on the equipment shall be bolted type unless specified otherwise.

C) Welding operations and fluxes shall be as per the approved standards.

D) All joints shall be made such that contact resistance is negligible.

E) All bimetallic connections shall be treated with suitable compound to prevent moisture ingress

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
191 of
225**

F) Metallic conduits and pipes shall be connected to the earthing system unless specified otherwise.
G) Lightning protection system down conductors shall not be connected to any earthing conductors above ground level.

Providing earthing with 80 mm dia, 3.0 M long GI (Heavy duty) perforated pipe as per IS:3043 (with latest ammendment) including providing suitable earth bus for interconnection, providing a mixture of salt & charcoal, making earth pit chamber with chequered plate cover as per standard Drawing. etc. all complete as per specification & direction of Engineer-In-charge

Providing Maintenance Free Earthing with Safe Earthing Electrode of 3 m length and 40 mm dia (Model SABO-MFE-40-3) and earthing compound (Model SABO-EREC) as per IS: 3043 including supply and fixing of Electrode, Earthing compound, earth bus, connecting cable & tape/ strip, making eathing pit chamber with chequered plate cover etc. all complete as per detailed specification, standard drawings and as per direction of Enginner -In-charge.

TESTING OF EARTHING SYSTEM

The contractor shall ensure the continuity of all conductors and joints. Following tests shall be done after completion of entire earthing job.

1. Earth pit resistance measurement by earth meggar of 10 Ohm range. Earth pit resistance for earth pits shall not be more than 1.0 ohm. Incase earth resistance is more than 1.0 Ohm, increase number of earth pit.
2. Earth continuity tests for all equipment by meggar.
3. Certificate for earth test shall be submitted by the contactor as per ie rules & regulation.
4. The contractor shall bear the cost of all such tests.

LAYING OF EARTH STRIPS:

Item includes supplying, laying, jointing of copper flats/ G.I flats/wires. Laying in trenches on finished floor by cutting groove in the floor/driveway & restoring it to original shape & along steel structure of GI flats/wires & making earthing terminations as per electricity rules, including providing earthing thimbles of GI wire at termination points. This item includes welding, drilling, bolting & provision of required hardware for jointing & terminating.

Supplying & laying of single core 16 sq.mm multi stand flexible PVC insulated copper cable with suitable size of crimping socket on one end and other shall be crocodile clip. This shall be installed near tanker unloading area. One end of the flexible cable shall be terminated in the nearest earth strip.

- 10.1 100mm Dia, 5.4 mm thk. CI pipe earth pole.
- 10.2 50mmx6mm GI strip connecting earth poles.
- 10.3 32mmx3mm GI strip connecting earth poles
- 10.4 Solid copper wire of no,8 swg for earth.

11 ELECTRICAL INSTALLATON (RUBBER MAT FOR MV PANNEL)

Rubber mat for MV Panel.

For electrical purpose upto 440 volts (0.5 KV) :

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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-MALIGAWATTA, COLOMBO.

**Page
192 of
225**

Thickness of the mat shall be 3 mm plus / minus 0.05 mm.

Upper surface should be with a pattern. The thickness of mat shall be measured at the root of the pattern.

Colour of mat shall be "Black". Length and width shall be 2 (Two) metres and 1 (one) metre respectively.

All other requirements of material, manufacture, dimensions, workmanship, finish, physical & electrical properties, water absorption, marking, test method & criteria of conformity etc., to be as per latest IS code 5424.

Test certificate to be provided for individual mat or a batch. IF TR (Test Report) is given for a batch, Batch No to be embossed on the mat without damaging the insulating property if the material. Manufacturer's identification, test passed, manufacturing date & working voltage also to be embossed.

Packing to be in rolled condition using ordinary polythene.

11.1 16.1 Supply of Rubber Mat for MV Pannel Board (1 M X 1.5 M) 440 V Grade.

12 ELECTRICAL INSTALLATION (MEGGER TEST)

GENERAL ITEMS

Workmanship

Good workmanship is an essential requirement to be complied with. The entire work of manufacture/ fabrication, assembly and installation shall conform to sound engineering practice. The work shall be carried out under the direct supervision of an engineer, employed by the contractor, who shall rectify then and there the defects pointed out by the engineer-in-charge during the progress of work. The qualification of engineer or supervisor for over all supervision and to take instructions from the engineer-in-charge shall be as specified in the special conditions.

A) Testing of installation

All the completed installations shall be tested as per specification for "testing of installation."

B) Drawings

The work shall be carried out in accordance with the drawings enclosed with the tender documents and also in accordance with modification thereto from time to time as approved by the engineer-in-charge or as per the drawing prepared by the contractor based on inventory and approved by engineer-in-charge.

All wiring diagrams shall be deemed to be 'drawings' within the meaning of the term as used in the conditions of contract. They shall indicate the main switch board, the distribution boards (with circuit numbers controlled by them), the runs of various mains and sub-mains and the position of all points with their controls.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
193 of
225**

All circuits shall be indicated and numbered in the wiring diagram and all points shall be given the same number as the, circuit to which they are electrically connected.

Commissioning on completion

1. Before the workman leaves the work finally, he must make sure that the installation is commissioned, after due testing.

2. Completion plan and completion certificate

(i) For all works completion certificate after completion of work as required shall be submitted to the engineer-in-charge.

(ii) Completion plan drawn to a suitable scale in tracing sheet with three blue print copies of the same shall also be submitted.

(iii) General layout of the building.

(iv) Locations of main switchboard and distribution boards.

(v) Position of all points and their controls indicating the circuit numbers controlled by them.

(vi) Types of fittings, viz. Fluorescent, pendants, brackets, bulk, head, fans and exhaust fans etc.

(vii) Name of work, job number, accepted tender reference, actual date of completion, names of division/sub-division, and name of the firm who executed the work with their signature.

12.1 Test electrical work of Sales Building.

12.2 Test electrical work of Service Station.

12.3 Testing electrical work of External electrical system.

13 OBTAINING 3PHASE CEB CONNECTION

Contractor has to obtain the necessary service connection from the Electricity Board by paying the statutory payment. The payment made shall be reimbursed on production of cash bill by the client at the given rate at the BOQ.

18.1 Obtaining 60 Amp 3Phase CEB Power Connection.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.Page
194 of
225**LIST OF DRAWINGS**

SN	DESCRIPTION	DRAWING NO
	ARCHITECTURAL DRAWINGS	
1	COUNCIL DRAWING	
2	SALES BUILDING DRAWING	
3	CANOPY DRAWING (PROPOSED)	
	STANDARD DRAWINGS	
4	FUEL PIPELINE TRENCH, CABLE TRENCH DETAIL	LIOC/ENG/STD/01
5	STANDARD DRAWING FOR BOUNDARY WALL	LIOC/ENG/STD/04
6	PUMP ISLAND GUARD RAIL DETAIL	LIOC/ENG/STD/08
7	HOARDING BOARD DETAIL – 45' X 15'	LIOC/ENG/STD/09
8	HOARDING BOARD DETAIL – 30' X 10'	LIOC/ENG/STD/10
9	HOARDING BOARD DETAIL – 20' X 8'	LIOC/ENG/STD/11
10	STANDARD DETAILS FOR PUMP ISLAND – 01	LIOC/ENG/STD/12
11	STANDARD DETAILS FOR PUMP ISLAND – 02	LIOC/ENG/STD/13
12	1200MM X 120MM FUEL TANK MANHOLE CHAMBER DETAILS WITH TRAP DOOR	LIOC/ENG/STD/14
13	900MM X 900MM FUEL TANK MANHOLE CHAMBER DETAILS WITH TRAP DOOR	LIOC/ENG/STD/15
14	ELECTRICAL CHAMBER DETAIL	LIOC/ENG/STD/16
15	STORM WATER CATCH PIT	LIOC/ENG/STD/17
16	DETAIL OF SUMP	LIOC/ENG/STD/18
17	CHAIN LINK FENCING	LIOC/ENG/STD/19
18	INSTALLATION OF 9 KL FUEL TANK – UNDER DRIVEWAY (EARTH PIT – ONE MANHOLE)	LIOC/ENG/STD/20
19	INSTALLATION OF 15 KL FUEL TANK – UNDER DRIVEWAY (EARTH PIT – TWO MANHOLE)	LIOC/ENG/STD/21
20	INSTALLATION OF 22.5 KL FUEL TANK – UNDER DRIVEWAY (EARTH PIT – TWO MANHOLE)	LIOC/ENG/STD/22
21	INSTALLATION OF 9 KL FUEL TANK – UNDER DRIVEWAY (MASONRY PIT – ONE MANHOLE)	LIOC/ENG/STD/23
22	INSTALLATION OF 15 KL FUEL TANK – UNDER DRIVEWAY (MASONRY PIT – TWO MANHOLE)	LIOC/ENG/STD/24
23	INSTALLATION OF 22.5 KL FUEL TANK – UNDER DRIVEWAY (MASONRY PIT – TWO MANHOLE)	LIOC/ENG/STD/25
24	DETAIL OF YARD LIGHT FOUNDATION	LIOC/ENG/STD/26
25	SCHEMATIC LAYOUT	LIOC/ENG/STD/27-I
26	M.V. PANEL BOARD DETAIL TYPE - 01	LIOC/ENG/STD/27-II
27	M.V. PANEL BOARD DETAIL TYPE - 01	LIOC/ENG/STD/27-III
28	TYPICAL EARTHING BLOCK DIAGRAM	LIOC/ENG/STD/28
29	EARTHING CONNECTION DETAIL	LIOC/ENG/STD/29
30	STANDARD PIPE ELECTRODE EARTH PIT	LIOC/ENG/STD/30
31	DETAIL OF SEPTIC TANK	LIOC/ENG/STD/31

SIGNATURE OF TENDERER
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TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
195 of
225

Note: The drawings are issued for reference in order to understand the extent of works involved.
Additional constructional drawings as per requirement shall be issued stage wise up on placement of
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**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
196 of
225****LIST OF APPROVED MAKES**

A. CIVIL WORKS			
SN	MATERIALS	APPROVED MAKES	BS CODE REF.
1	ORDINARY PORTLAND CEMENT	(HOLCIM / TOKYO /L&T / LAFARGE/EXPOCEMENT/MITSUI/ NIPPON)ORDINARY PORTLAND CEMENT COMPLY WITH SLS	8112 : 1989 12269 : 1987
2	STRUCTURAL STEEL - SECTIONS, PLATES, RODS, FLATS, STRIPS ETC.,	LANKA STEELS CENTRE/ JINDAL STEEL/ ONIDA STEELS/ TATA / SAIL / VIZAG / HINDUSTAN	2062 : 1999
3	MS TUBULAR SECTIONS	LANKA STEELS CENTRE/ JINDAL STEEL/ ONIDA STEELS/ TATA / SAIL / VIZAG / HINDUSTAN	1161 : 1963
4	REINFORCEMENT STEEL – MILD STEEL AND MEDIUM TENSILE BARS	CHICO /CONFAB /GTB /MELWA COMPLY WITH SLS	432 : 1982
5	REINFORCEMENT STEEL – HIGH STRENGTH DEFORMED STEEL BARS	CHICO /CONFAB /GTB /COMPLY WITH SLS	1786 : 1985
6	BURNT CLAY BUILDING BRICKS	ANY KILN APPROVED BY LIOC	1077 : 1992
7	STANDARD CERAMIC TILES (WALLS/FLOOR) / VITRIFIED CERAMIC TILES	LANKA TILES/ROYAL CEREMIC /NAVEEN CERAMIC OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	13712 : 1993
8	ROLLING SHUTTERS/ROLLING GRILLS	(THREE SINGHE / ELCARDO OR EQUIVALENT) SHALL BE OF MAKE AS APPROVED BY LIOC ENGINEER. LOCAL FABRICATION SHALL NOT BE ACCEPTED.	6248 : 1979
9	ALUMINIUM SECTIONS FOR DOORS, WINDOWS, VENTILATORS, PARTITIONS	ALUMEX/ LANKA ALUMINIUM OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	1948 , 1285
10	PRELAMINATED PARTICLE BOARD	NOVOPAN, VK ENTERPRISES	12823 : 1990
11	DOOR CLOSER	EVERITE / HARDWYN / NEWSTAR/ EQUIVALENT APPROVED MAKE	3564 : 1996
12	FLOOR SPRING	EVERITE / HARDWYN / EQUIVALENT APPROVED MAKE	6315 : 1992
13	WATERPROOFING COMPOUNDS	BITUMEN WATER PROOFING MEMBRANE & LIQUID ACRYLIC FLEXIBLE MEMBRANE: XYPEX/ FINCO/ THOROSEAL/ FOSROC/ SESCO/ LANKEM OR EQUIVALENT APPROVED BY LIOC	2645 : 2003
14	FLOOR HARDENER/RESIN	LANKEM/CIC/ASIAN PAINT	9197 : 1979

**SIGNATURE OF TENDERER
SEAL**

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
197 of
225**

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
15	ACRYLIC EMULSION, PAINTS, DISTEMPERS	CIC OR OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	354 : 1989, 428 : 2000
16	WATERPROOF CEMENT PAINTS	FINCO/BARALASTIC/THOROUG/ LANKEM	5410 : 1992
17	FLOAT GLASS	SEMAGE /ASOKA GLASS/ GLOBE OR APPROVED EQUIVALENT	14900 : 2000
18	PRESSED CLAY TILES (FOR WATERPROOFING)	LANKA TILES/ ROYAL CERAMIC/ NAVEEN CERAMIC OR ANY APPROVED MAKE	2690 : PART I : 1993
19	PRECAST CEMENT CONCRETE KERBS	CLASS I TILES FROM APPROVED KILNS	5758 : 1984
20	GRANITE TILES	STAR GRANITE OR ANY APPROVED MAKE	14223 : PART 1 : 1995
21	RCC HUME PIPES	ELS/ LANKAN HUME PIPES	458 : 2003
22	ROAD MARKING PAINTS	SHALIMAR / MRF	164 : 1981
23	SQUATTING PAN	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	2556 / 774
24	EUROPEAN TYPE WATER CLOSET	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	2556
25	WASHBASIN	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	2556
26	SINK (VITREOUS CHINA)	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	2556
27	FLUSHING CISTERN (PLASTIC)	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	7231 : 1994
28	EWC PLASTIC SEAT COVER	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	2548 : PART II : 1996
29	MIRROR	SEMAGE /ASOKA GLASS/ APPROVED EQUIVALENT	3438 : 1994
30	SOAP TRAY	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	
31	TOWEL RAIL	AMERICAN STANDARD /TOTO/ ROCELL OR APPROVED EQUIVALENT	
32	PVC PIPES AND FITTINGS(DRINKING WATER)	S-LON /ARPICO/ ANTON/ NATIONAL/ OR APPD EQUIVALENT AS PER SLS	4985 : 2000

**SIGNATURE OF TENDERER
SEAL**

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
198 of
225**

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
33	PVC PIPES AND FITTINGS(CABLE CONDUITS)	ANY APPROVED MAKE AS PER SLS	9537 / 3419
34	PVC PIPES AND FITTINGS (RAINWATER / WASTE)	S-LON /ARPICO/ ANTON/ NATIONAL/ OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	4985 : 2000
35	CPVC PIPES & FITTINGS	S-LON /ARPICO/ ANTON/ NATIONAL/ OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	
36	UPVC PIPES & FITTINGS	S-LON /ARPICO/ ANTON/ NATIONAL/ OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	
37	GI PIPES	TATA/ JINDAL/ ZENITH/ CHICO OR APPD EQUIVALENT AS PER SLS	6631 : 1972
38	GI FITTINGS	TATA/ JINDAL/ ZENITH/ CHICO OR APPD EQUIVALENT AS PER SLS	1239 : 1992
39	GM GATE VALVES FOR SANITARY & PLUMBING WORKS	PLUMBER/PEGLER/ KITZ/ APPD EQUIVALENT	778 : 1984
40	CP BRASS SPRAY SHOWER WITH BALL AND SOCKET	AMERICAN STANDARD/NOVACE /ESSESS /ARK / SOMA / METRO-SUPER/ KITZ	
41	BRASS FLOAT VALVES WITH COPPER FLOATS	LEADER / ORIENT / ZOLOTO/ NETA/ PLUMBER/PEGLER/ KITZ	1703 : 2000
42	CP BRASS STOP COCKS	AMERICAN STANDARD/NOVACE /ESSESS /ARK / SOMA / METRO-SUPER/ PLUMBER/PEGLER/ KITZ	781 : 1984
43	POLYETHYLENE WATER TANK	S-LON /ARPICO/ ANTON/ NATIONAL/ OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	12701 : 1996/ 10146 : 1982
44	FLOOR TRAP (NAHANI TRAP)	ROCLL/ APPD EQUIVALENT	2556 :1973
45	SW GULLY TRAP	ANY APPROVED MAKE	651 : 1992
46	CP BRASS PILLAR TAPS	PLUMBER/PEGLER OR EQUIVALENT COMPLY WITH SLS	8931 : 1993
47	FLUSH VALVES	PLMBER/PEGLER OR EQUIVALENT COMPLY WITH SLS	9758 : 1981
48	PADLOCKS	GODREJ / HARRISON	1018 : 1982
49	MORTICE SLIDING DOOR LOCK	GODREJ OR EQVT. APPROVED MAKE	8760

**SIGNATURE OF TENDERER
SEAL**

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
199 of
225**

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
50	MORTICE DEAD LOCK	GODREJ OR EQVT. APPROVED MAKE	7540
51	REBATED MORTICE LOCK (VERTICAL)	GODREJ OR EQVT. APPROVED MAKE	6607
52	MORTICE LOCK (VERTICAL TYPE)	GODREJ OR EQVT. APPROVED MAKE	2209
53	CHAINLINK FENCING FABRIC	MASCON/ ANY APPROVED MAKE	2721 : 2003
54	BOREWELL WATER PIPE AND FITTINGS – HDPE	ANY APPROVED MAKE	4984 : 1995/ 8360 : 1977
55	BOREWELL CASING PIPE - STEEL	ANY APPROVED MAKE	4270 : 2001
56	SUBMERSIBLE PUMPSET FOR WATER	JINASENA/ ARPITECT / CENTRIC OR EQUIVALANT	8034 : 2002
57	MOTOR FOR SUBMERSIBLE PUMPSET FOR WATER	ANY APPROVED MAKE	9283 : 1985
58	FIRE BUCKET	ANY APPROVED MAKE	2546 : 1974
59	SYNTHETIC ENAMEL PAINT	CIC / LANKEM OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	2932 : 2003
60	BOLTS, NUTS, WASHERS (JOINTS STEEL STRUCTURAL WORK)	ANY APPROVED MAKE WITH MTC	4000 : 1992, 3757 : 1985, 6623 : 1985, 6649 : 1985
61	FOUNDATION BOLTS	ANY APPROVED MAKE WITH MTC	5624 : 1993
62	FALSE CEILING FOR CANOPY (150F)	ADMO/ METROOF/ RN/ BLUE SCOPE LYSAGHT	STEEL : IS 513 GALVANIZING : IS 277 ORGANIC COATING: IS 14246
63	HI-RIB BARE GALVALUME, HI-RIB GALVALUME COLOUR COATED, GI HI-RIB, GI HI-RIB COLOUR COATED ROOF SHEETING /GUTTER /FLASHINGS.	ADMO/ METROOF/ RN/ BLUE SCOPE LYSAGHT	STEEL : ASTM A 446 AZ 150 COATING : ASTM A792
64	INTERLOCK CONCRETE PAVERS FOR DRIVEWAY AND PARKING	SMS HOLDINGS/ SUPREME TRADING/ APPD EQUIVALENT AS PER SPECS.	AS PER BS 6717 : PART1 : 1986 AND AS PER IS 1237 1980 - AFTER PRIOR APPROVAL

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.Page
200 of
225

			FROM LANKA IOC PLC
65	ACRYLIC EMULSION/ SEMI ACRYLIC EMULSION PAINTS	CIC OR OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	15489, 354
66	TILES	LANKA TILES/ ROYAL CEREMIC OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	
67	AL WORK	ALUMEX/ LANKA ALUMINIUM OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	
68	LIPPED CHANNEL	LANKA STEEL CENTRE/ ONIDA STEELS OR EQUIVALENT APPROVED BY LIOC	
69	ROOFING SHEET	ADMO/ METROOF/ RN/ BLUE SCOPE LYSAGHT	
70	SUSPENDED FALSE CEILING	ADMO/ METROOF/ RN/ BLUE SCOPE LYSAGHT	
71	WALL PUTTY	CIC OR OR EQUIVALENT APPROVED BY LIOC COMPLY WITH SLS	
72	PVC COLOUR SHEETING	FINOLEX OR EQUIVALENT MAKE	6307

B. MECHANICAL WORKS

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
1	M.S ERW PIPES (PLAIN END) – CLASS 'B'	TATA /JINDAL / ZENITH/ SURYA ROSHNI	1239 -2004
2	M.S ERW PIPES (PLAIN END) – CLASS 'C'	TATA /JINDAL / ZENITH/ SURYA ROSHNI	1239 : 2004
3	M.S ERW PIPES (SCREWED END) – CLASS 'B'	TATA /JINDAL / ZENITH/ SURYA ROSHNI	1239 -2004
4	HORIZONTAL TYPE/VERTICAL TYPE GUN METAL CHECK VALVE SCREWED/ANGULAR	LEADER /OPW	10989 : 1984/ 11733 : 1986
5	SLIP ON / BLIND FLANGES	APPROVED MAKE	6392 : 1971
6	WELDING ELECTRODES	LINCOLN/ADVANI OERLIKON/ESAB/D&H SECHERON/HONAVAR ELECTRODES/MAILAM INDIA/ROYAL ARC ELECTRODES/MARUTI WELD/GEE	817
7	BOLTS & NUTS (PIPELINE WORK)	TVS /NEXCO /TRIANGLE / TATA	1367
8	COMPRESSED ASBESTOS GASKET	CHAMPION / HINDUSTAN FERRADO / PERMANITE	2712 : 1998
9	PRESSURE GAUGE	H GURU/ MANOMETER INDIA/ WARI	3624 : 1987

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.Page
201 of
225

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
10	UNION	ANY APPROVED MAKE	1239
11	STEEL BUSH	ANY APPROVED MAKE	1239
12	M.S CAP	ANY APPROVED MAKE	1239
13	AIR COMPRESSOR	NEWCO/ ELGI OR EQUIVQLENT APPROVED BY LIOC	5456 : 1985
14	DIGITAL TYRE INFLATOR	CLIPSAL/ PCL/ ELGI/ AIR TECH	
15	BITUMINOUS PAINT	SHALIMAR / CIC OR EQUIVALENT APPROVED MAKE	9862
16	BITUMEN MASTIC	SHALIMAR / CIC OR EQUIVALENT APPROVED MAKE	5871 : 1987
17	ZINC PHOSPHATE PRIMER	JENSON & NICHOLSON / I.C.I /BERGER /ASIAN PAINTS / KANSAI NEROLAC/ CIC	104 : 1979
18	SYNTHETIC ENAMEL PAINT	JENSON & NICHOLSON / I.C.I /BERGER /ASIAN PAINTS / KANSAI NEROLAC/ CIC	2932 : 2003
19	ALUMINIUM PAINT (GENERAL PURPOSE)	JENSON & NICHOLSON / I.C.I /BERGER /ASIAN PAINTS / KANSAI NEROLAC/ CIC	2339 : 1963
20	SPRAYED ALUMINIUM AND ZINC COATING ON IRON AND STEEL	JENSON & NICHOLSON / I.C.I /BERGER /ASIAN PAINTS / KANSAI NEROLAC/ CIC	5905 : 1989
21	C.I /DI MANHOLE COVER	NECO / ARECO/ APPD EQUIVALENT	1726 : 1991
22	CORROSION PROTECTION TAPE (COAL TAR BASED)	RUSTECH / TAPEX / CORPO / PARAMOUNT/IWL	15337 : 2003
23	SILICA GEL TRAP ASSEMBLY	ANY APPROVED MAKE	3401 : 1992
24	MS CHEQUERED PLATE	ANY APPROVED MAKE	3502 : 1994
25	PIPE - ERW & WRAPING COATING	ONIDA STEELS OR EQUIVALENT APPROVED BY LIOC	
26	TANK TOP VALVE	OPW/ LEADER OR EQUIVALENT APPROVED BY LIOC	
27	GI PIPE AND FITTINGS FOR AIR AND WATER	TATA /JINDAL / ZENITH /EQUIVALENT APPROVED MAKE	1239

C. LIST OF APPROVED MAKES FOR ELECTRICAL WORKS

SN	MATERIALS	APPROVED MAKES	IS CODE REF.
1	1.1 K.V PVCAPVC /XLPE INSULATED ARMOURED ALUMINIUM CONDUCTOR CABLES	KELANI CABLES, SIERRA, ACL CABLES, KML	1554 : PART 1 : 1988, 8130 : 1984, 7098 : PART 1
2	COPPER FLAT CABLE FOR SUBMERSIBLE PUMP	KELANI CABLES, SIERRA, ACL CABLES, KML	694 : 1990, 8130 : 1984
3	CABLE GLANDS & LUGS (NON FLAMEPROOF)	MIC, HPI, BRACO, KELANI CABLES, SIERRA, ACL CABLES	8308 , 8309 :1987, 12943:1990

SIGNATURE OF TENDERER
SEAL

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
202 of
225**

SN	MATERIALS	APPROVED MAKES	IS CODE REF.
4	CABLE TERMINATION KITS, STARIGHT JOINT KITS	RAYCHEM, M-SEAL, LYCAB	7093 : 1973 , 8438, 9553 : 1987
5	FLAME PROOF CABLE GLANDS	BALIGA, FLEXPOR, FCEG, EXPROTECTA, CEAG	8308 , 8309 :1987, 12943:1990
6	GI PIPE MEDIUM DUTY FOR CABLE LAYING	TATA, JINDAL	1239 PART 2 : 1992
7	HOT DIP GALVANIZED M.S CABLE TRAYS	CLASSIC, FIXOTECH, METALICA, PILCO	3954 : 1991
8	PVC CHANNEL TYPE CABLE TRAYS	SFX OR APPROVED EQUIVALENT	
9	FLAME PROOF CABLE JUNCTION BOXES	BALIGA, FLEXPOR, FCG POWER, EXPOTECTA/ CEAG	10606 : 1983, 14772 :2000
10	MAINTENANCE FREE EARTHING SYSTEM – SAFE EARTHING ELECTRODE	ASHLOK OR APPROVED EQUIVALENT	3043 : 1987
11	LIGHTNING PROTECTION SYSTEM	ANY APPROVED MAKE	2309 : 1989
12	INDICATING LAMPS (LED TYPE)	TECHNIK, SCHNEIDER,SIEMENS,BCH ,C&S, L&T	1901 : 1978
13	INDICATING METERS	AE,MECO, L&T,ENERCON, IMP,GE, HAVELLS	1248 PART 2 : 2003
14	SELECTOR SWITCHES	KAYCEE, RISHAB ,L&T ,SALZAR, SIEMENS	13947 PART 5 :2004
15	CURRENT TRANSFORMERS	AE,INTRANS ,KAPPA,INTECH	2705 PART 1,2 :1992, 4201 : 1983
16	RELAYS	ALSTOM, SIEMENS, JVC ELECTRONICS ,ENERCON	3842,3231, 4483 & 8686
17	SWITCH DISCONNECTOR FUSE UNITS/CHANGEOVER SWITCHES(SWITCH FUSE OR ONLOAD TYPE)	L&T,SIEMENS, SCHNEIDER ELECTRIC ,HPL, C&S, HAVELLS, KEVILTON, ORANGE, GE, SCHNEIDER, HAGER, ABB	13947 : 1993, 2004
18	MOULDED CASE CIRCUIT BREAKER (MCCB)	SIEMENS, SCHNEIDER ELECTRIC , C&S ,L&T, HAVELLS, KEVILTON, ORANGE, GE, HAGER, ABB, CHERRY, MERLIN GERINE, TERASAKI, KLOCKNER MOELLER	13947 : 1993, 2004, 60947 : 2003
19	HRC FUSES/FUSE CARRIERS	L&T,SIEMENS, SCHNEIDER ELECTRIC ,HPL, C&S	2086 : 1993, 9926 :1981, 13703 : 1993
20	MINIATURE CIRCUIT BREAKER(MCB)/RESIDUAL CURRENT CIRCUIT BREAKER(RCCB)/RESIDUAL CURRENT BREAKER OPERATED(RCBO)	MDS, L&T HAGER ,SCHNEIDER, HAVELLS, BCH, STANDARD, KEVILTON, ORANGE, GE, HAGER, ABB, CHERRY, MERLIN GERINE, TERASAKI, FEDERAL(TURKEY), SEIMENS(GERMANY	13032 : 1991

**SIGNATURE OF TENDERER
SEAL**

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
203 of
225**

SN	MATERIALS	APPROVED MAKES	BS CODE REF.
21	RIGID PVC / FLEXIBLE CONDUITS & ACCESSORIES	PRECISION, CLIPSAL, LAPP KABEL, DIAMOND, BALCO, UNIVERSAL, AVON PLAST	9537 : PART 1:1980 & PART 3: 1983 , 3419 : 1988
22	METAL SWITCH BOXES	MK, ANCHOR, MDS LEGRAND	2675 : 1983, 13947 :2004
23	MS JUNCTION BOX, MS FAN BOX	HOMELITE, PEW, GUPTA	14772 : 2000
24	SWITCHES, SOCKETS, BELL PUSH, ELECTRONIC REGULATORS, TELEPHONE, TV, RJ 45 SOCKETS ETC PIANO TYPE	CLIPSAL, ORANGE, HAVELLS, TENBY, MK, CRABTREE, PDL, KEVILTON ANCHOR, M.K INDIA, MDS, LEGRAND, GE	3854 : 1997, 11037 : 1984, 1293
25	MODULAR TYPE SWITCHES, SOCKETS, BELL PUSH, ELECTRONIC REGULATORS, TELEPHONE, TV, RJ 45 SOCKETS ETC	CLIPSAL, ORANGE, HAVELLS, TENBY, MK, CRABTREE, PDL, KEVILTON ANCHOR, CARB TREE, MK INDIA, CLIPSAL, MDS, LEGRAND	3854 : 1997, 11037 : 1984, 1293 : 2005
26	TELEPHONE CABLE	ACL, KELANI, SIERRA, DELTON, CIPLOX, FIVE STAR	10579 : 1983
27	TV CO-AXIAL CABLE	ANY APPROVED MAKE	5662 : 1991
28	CAT 6 COMPUTER CABLE	ANY APPROVED MAKE	
29	METAL CLAD PLUG & SOCKET	L& T HAGER, HAVELLS, SIEMENS SCHNEIDER ELECTRIC ,MDS, INDO ASIAN, ORANGE, CLIPSAL	1293 : 2005
30	MCB DISTRIBUTION BOARD	MDS, SIEMENS, L&T HAGER ,SCHNEIDER, HAVELLS, INDO ASIAN, CHERRY, ORANGE, GE, ABB	13032 : 1991
31	SURGE ARRESTORS	MDS, SIEMENS, L&T HAGER ,SCHNEIDER, HAVELLS	13032 : 1991
32	DOL STARTERS ,STAR DELTA STARTERS	SIEMENS, L&T, SCHNEIDER ELECTRIC , C&S, CROMPTON GREAVES	13947 : 1993, 2004
33	SWAGED TUBULAR YARD LIGHT POLES/ HOLLOW SECTION POLES	UNIQUE POLES OR ANY APPROVED EQUIVALENT	2713 PART 1,2,3 :1980
34	OCTAGONAL LIGHT POLE	PHILIPS / WIPRO/ BAJAJ/ GALVAPOLE/ LYSAGHT	2713 PART 1,2,3 :1980
36	LIGHT FITTINGS & CONTROL GEARS	PHILIPS, WIPRO, CROMPTON GREAVES, BAJAJ	2418 :1977, 10322 : 1987, 10947 :1984, 13383:1992
37	FLAME PROOF LIGHTING FIXTURES	FCG POWER, BALIGA, FLEXPPO	2206 PART 1 : 1984
38	CEILING FANS	KDK, TELESONIC, HAVELLS, GE, CROMPTON, USHA, KHAITAN, ANCHOR, ORIENT, BAJAJ, ORTEM	374 : 1979
39	VOLTAGE STABILIZER	V GUARD/ APPD EQUIVALENT	9815 : 1994

**SIGNATURE OF TENDERER
SEAL**

**TENDER NO: LIOC/ ENG/ PT-03/ 2025-26****TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.****Page
204 of
225**

40	MATERIALS	APPROVED MAKES	IS CODE REF.
SN	LAMPS/ CHOKES ETC	CROMPTON GREAVES, PHILIPS, HAVELLS, ORANGE, CLIPSAL, THORN, OSRAM, BG	5081:1990, 15111:2002, 1534:1977,2215:20 06,6616:1982,9900, 9974:1981,13021: 1991
41	EXHAUST FANS	KDK, TELESONIC, HAVELLS, GE, CROMPTON, USHA, KHAITAN, SIROCCO, ANCHOR, BAJAJ, ORTEM	2312 : 1967
42	CALLING BELL	CLIPSAL, ORANGE ANCHOR, M.K INDIA, MDS, LEGRAND	302, 2268 : 1994
43	CAPACITORS (MPP HD)	OPTIMS, THORN, PHILLIPS, BG, BRITISH, GERMAN OR JAPANESE L&T, UNIVERSAL ,SAHASPRAGUE LTD, CROMPTON GREAVES/ SIEMENS	13340 : 1993
44	SMF TYPE LEAD ACID BATTERIES	EXIDE, ROCKET, STANDARD FURUKAVA, AMCO, AMARON, PANASONIC	12292 : 1988
45	INTEGRATING METERS	SIMCO, L&T,ABB,SIEMENS, AE, ENERCON	1248 PART 3 : 2003
46	RUBBER MATS FOR ELECTRICAL PURPOSE	ANY APPROVED MAKE	5424 :1969
48	EXTERNAL LIGHT FITTINGS	NIKON/ ORANGE/ BAJAJ/ GE OR EQUIVALENT APPROVED BY LIOC	
49	MCCBS, MCBS, TPN, ELCB	CHERRY/ SIEMENS/ KEVILTON/ ORANGE/ HAVELLS/ GE/ SCHNEIDER/ HAGER/ ABB OR EQUIVALENT APPROVED BY LIOC	
50	PANEL	KIK/ ELECTRO SERVO OR EQUIVALENT	
51	INTERNAL LIGHT FITTINGS	PHILIPS/ BAJAJ/ WIPRO OR EQUIVALENT APPROVED BY LIOC	
52	OCTAGONAL LIGHT POLE	PHILIPS / BAJAJ / WIPRO/GALVAPOLE	
53	OCTAGONAL POLE LIGHT FIXTURES	PHILIPS / BAJAJ / WIPRO	10322
54	PLUMBING ACCESSORIES	PLUMBER/ PEGLAR OR EQUIVALENT APPROVED BY LIOC	
55	ANTI TERMITE TREATMENT	LANKEM OR EQUIVALENT APPROVED BY LIOC	

NOTES :

1) IN CASE OF ALL THE ABOVE IS PUBLICATIONS, REFERENCES SHALL BE MADE TO THE LATEST VERSIONS AS AMENDED AND REVISED UPTO DATE. AMONG THE LISTED APPROVED MANUFACTURERS/MAKES, THE ITEMS USED SHOULD BE OF IS APPROVED MAKE UNLESS OTHERWISE SPECIFIED AND SUBJECT TO FINAL APPROVAL OF LIOC.

**SIGNATURE OF TENDERER
SEAL**



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
205 of
225

LED CANOPY LIGHT SPECIFICATIONS

TECHNICAL SPECIFICATIONS

1. Technical Specifications for LED:

- a. LED Efficiency shall be greater than 140 Lumens/Watt @ 350mA drive current. In respect of LEDs of higher power ratings, drive current greater than 350mA can be accepted if the LED/s LM 80 test report support the same
- b. LED shall be SMD type LED for all applications. COB type to be considered only for applications such as Highbays, Flood Lights & Flameproof Light Fittings

Approved makes of different LED technology / types shall be as below:

LED Technology / Type	Approved Make
SMD	Nichia, Osram, Lumileds (Erstwhile Phillips Lumileds), CREE
COB	Citizen, Bridgelux
Domestic/Decorative Luminaries	Everlight Taiwan, Edison Taiwan, Samsung Korea, Osram Germany along with makes approved for SMD

- c. Test report for Ambient Temperature of 55 / 85 / 105 Deg C at Rated and Maximum current shall be submitted for SMD type LED. For COB type LED, as soldering temperature is not applicable for COB technology, LM 80 test report shall be submitted.
- d. TM 21 life projection calculations along with LM 80 for all three ambient temperature of 55 /85 /105 Deg C as per applicable standard shall be submitted to substantiate that life of LED Chip shall be more than 50,000 Hrs for both commercial and industrial range and 25,000 Hrs for LED Bulb, domestic and decorative range
- e. Reported life span of LEDs used in the Luminaire shall be greater than 50,000 Hrs at the soldering point temperature of 85 Deg C and at luminaire driving current
- f. The LEDs shall comply to Photo biological Safety norms as per IEC62471 / EN62471 / IS:16108 and should fall in the exempt or low risk group for outdoor LED luminaires.
- g. View angle: typical 120 Deg.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
206 of
225

- h. Colour temperature of the proposed white colour LED shall be from 5700K (i.e. 5665K $\pm$ 355K) to 6500K for indoor type luminaire Step 5 or Step 3 McAdam as per ANSI standard C78.377A & 6500 K (I.e. 6500K $\pm$ 355K). For outdoor type luminaries
- i. Step 5 McAdam as per ANSI standard C78.377A, will be accepted on account of colour consistency.
- j. Colour Rendering Index (CRI): CRI should include all colour ranges from R1 to R15, shall be > 80 for indoor luminaire and > 70 for outdoor luminaire

2. Technical requirements for LED driver:

- a. Minimum efficiency of driver: The minimum efficiency of LED driver shall be 85% for driver power output rating $\leq$ 40W and 87% for driver output rating > 40W
- b. Power factor of complete fitting: Greater than 0.9 (Except for Domestic / Decorative LED luminaire).
- c. In-built high voltage cutoff $\geq$ 290 Volt (High)
- d. Short circuit protection / Open load protection shall be required.
- e. Total Harmonic Distortion (THD): Less than 10% for full load for more than 20W and less than 20% for less than 20W. Not applicable for Domestic / Decorative LED fixtures.
- f. Isolated driver should be used.
- g. Potting of LED Driver: For driver power output rating > 50W, potted driver shall be mandatory requirement.
- h. The power supply shall be connected to the LED PCBs through proper connectors.
- i. EMI /EMC compliance: Compliance to the following EMI /EMC standards:

CISPR 15 / IS:6873 (CE, RE, CDN) or compliance to equivalent EN standard.,
IEC: 61547 (reference standards are listed as follows)
- j. Driver shall comply with the safety requirements laid down in IEC:61347-2-13 / EN:61347-2-13 / IS:15885-2-13.
- k. Driver shall also comply with the performance requirements as per IEC:62384 / IS:16104.

SIGNATURE OF TENDERER
SEAL

**3. Technical requirements of electronic components used:**

The circuit boards and electronic components to be used in the luminaire should be of rating / type so as to provide reliable functioning. Following shall be the requirements during procurement:

- a. MCPCB is to be used for SMD technology for LED wattage in excess of 0.5. The minimum thickness should be 1.0 mm for indoor and 1.6 mm for outdoor type luminaire. However the same is not applicable for COB.
- b. FR4 grade PCBs of minimum thickness of 1.6mm shall be used in driver circuits. The same is not applicable for COB.

4. Technical requirement of luminaire:

- a. The luminaire shall have LM 79 / IS:16106 test report from NABL accredited laboratory.
- b. The minimum system lumen efficacy of the luminaire shall be 95 lm/W for luminaire system wattage > 15 W. The same shall be at least 50 lm/W for decorative fixtures.
- c. Following shall be required in terms of secondary lens / optics:
 - i. Indoor lights like bulb, tube, down lighter with a diffuser may not have secondary lens.
 - ii. Outdoor Industrial luminaire like well glass, flat glass may not have secondary lens / optics.
 - iii. For other Industrial and Outdoor fixtures, luminaire must have secondary lens / optics of type PMMA / Borosilicate glass / Polycarbonate.
- d. Colour temperature: 6500 K (6500K $\pm$ 355K, as per ANSI standard C78.377A).
- e. CRI: CRI should include all colour range from R1 to R15 and Ra shall be > 80 for Indoor luminaire and > 70 for Outdoor luminaire.
- f. Housing of luminaire: Housing of Outdoor and / or FLP shall be Pressure die-cast LM6 / ADC12 / LM24. For Indoor, non-weather proof items like CRCA / PC / Aluminium Extrusion housing can be used.
- g. Cover type: For Outdoor type fittings, cover type shall be toughened glass or UV stabilized polycarbonate whereas for Indoor and non-weather proof items, UV stabilized Polycarbonate can be used.
- h. Housing Ingress protection:

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
208 of
225

Application Type	Minimum Ingress Protection required
LED Street Light	IP66
LED Flood Light / Outdoor Industrial	IP65
Domestic and Commercial Indoor (Such as Administrative Building, Stores)	IP20
Toilet Fixtures	IP44
Industrial Indoor (such as High bay fittings, Medium bay fittings)	IP54

- i. Impact resistance: For Outdoor fittings minimum impact resistance shall be IK-05 and not applicable for Indoor fixtures.
- j. Temperature rise test: When the luminaire has stabilized thermally, soldering point test shall not be applicable.
- k. Temperature rise (above ambient) of heat sink should generally remain within 20 Deg C relaxation on this account can be granted as long as the soldering point temperature limit of 85 Deg C is not violated and there is no unacceptable outcomes.
- L. Flameproof light fittings shall be certified for use in hazardous areas as per area classification and the flameproof certificate shall be submitted along with the offer. Explosion proof certificate from PESO shall be submitted before or along with supply of such light fittings.

5. Inspection & Testing:

- a. Following acceptance tests shall be carried out as per relevant standards and approved sampling plan:
 - i. Visual and dimensional checks.
 - ii. Resistance to humidity test.
 - iii. Insulation resistance (IR) test.
 - iv. High Voltage test.
 - v. Over-voltage Protection test
 - vi. Total Harmonic Distortion (THD) test.
 - vii. Reverse polarity test.
 - viii. Temperature rise test.
 - ix. Ingress protection test.

Type test report / routine test certificates from NABL/SLAB accredited labs shall be submitted along with supply.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
209 of
225

6. Execution of electrical works:

- a. During the execution of job temporary connections are to be provided by the Contractor and all possible assistance shall be rendered by the Contractor for the smooth operation of the respective Retail outlet/ Depot/ Terminal. No extra payment shall be made on this account.
- b. All temporary connections are to be spark proof/ flame proof as required and shall be got approved from Site Engineer.
- c. Test Report (if required for this job as decided by the engineer) duly approved by the local Electricity Department shall be submitted by the Contractor after completion of the work. Any payment to Electricity Department needed shall be borne by the Contractor.
- d. The entire electrification work shall be carried out by the Contractor under supervision of licensed Electrical supervisor to the satisfaction of local Electricity Department / Site Engineer.
- e. The entire electrification work shall be carried out as per I.E. Rules / Local Electricity regulation /Lanka IOC specification as applicable.
- f. All metal covering, which were used to protect cables and apparatus, shall be efficiently earthed. The metal covering used to carry the cable must be electrically continuous and this includes the entire switchgear casing, if they are made of metal.

7. WARRANTY:

The Supply of LED fittings shall be covered by following minimum warranty from the date of expiry of contractual period of the fittings:

60 Months warranty for Indoor & Outdoor commercial / Industrial complete luminaries including LED.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
210 of
225

FORM OF AGREEMENT

THIS AGREEMENT is made and entered into on this day ofTwo Thousand Twenty Five between Lanka IOC PLC, herein after called and referred to as the Employer of the ONE PART and a Company duly incorporated under the Companies Ordinance and having it's registered office at , (hereinafter called and referred to as the Contractor which term or expression as herein used shall as and when the context so requires or admits of construction mean, and include the said Lanka IOC PLC , their heirs, successors and administrators) of the OTHER PART.

WHEREAS the Employer is desirous that the works more fully described in the documents attached hereto be executed, completed maintained and has accepted the tender dated by the Contractor for the execution, completion and maintenance of the said works.

NOW THIS AGREEMENT WITNESSED as follows: -

- (1) The words and expressions in the agreement shall have the meaning assigned to them in the conditions of contract, which is part and parcel of this agreement and hereinafter referred to.
- (2) The following documents shall be deemed to from, be read with and construed as part and parcel of this agreement
 - (a) The Tender aforesaid
 - (b) Letter of acceptance of the Tender
 - (c) Drawings
 - (d) Conditions of Contract – Parts I & II
 - (e) Tender schedule (Bills of Quantities)
 - (f) Specifications
 - (g) Memorandum of understanding if any
- (3) The Contractor shall execute, complete, commission, test, hand-over and maintain the works and remedy defects, in conformity in all respects with the provisions of the contract, more fully described in the Drawings, Tender schedule (Bills of Quantities), Specifications and Conditions of Contract aforesaid, in consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned.
- (4) The Employer shall pay the Contractor the Contract price at the times and in the manner described by the aforesaid Schedule of payments. In consideration of the execution, completion and maintenance of the works aforesaid.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
211 of
225

In witness whereof the party of the first part has set his hand hereunto and the party of the second part has caused its common seal be hereunto affixed and signed on the day and year aforementioned.

ON BEHALF OF EMPLOYER

ON BEHALF OF CONTRACTOR

.....

.....

.....

.....

Signed, sealed and delivered
by the said parties in the presence of :

Witnesses

(1)

(2)

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
212 of
225

CONDITIONS OF CONTRACT PART I

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
213 of
225

CONDITIONS OF CONTRACT PART I

L IOC PLC

CONDITIONS OF CONTRACT PART I

General Conditions of Contract shall be in accordance with the following publication by the Institute for Construction Training and Development (ICTAD)- Sri Lanka of the Ministry of Housing, Construction and Public Utilities. (Formerly of the Ministry of Local Government, Housing and Construction)

Conditions of Contract for works of Building & Civil Engineering in Sri Lanka (with Forms of Tender & Agreement) revised edition / January 1989 ICTAD Publication No. SCA/1.

Conditions of particular application are as per Conditions of Contract Part II.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
214 of
225

CONDITIONS OF CONTRACT PART II

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
215 of
225

CONDITIONS OF CONTRACT PART II

LIOC PLC

CONDITIONS OF CONTRACT PART II

CLAUSE 1 : *Definitions and interpretations*

1.1.1 : The Employer is

**Lanka IOC PLC
20, West Tower,
World Trade Centre,
Echelon Square,
Colombo 01.**

1.1.2 : Sub-clause 1.1.2 is deleted and the following is substituted therefore

The Contractor means the person who has contracted for the works herein specified and its successors and not any assignee of such person.

1.1.3 : Sub-clause 1.1.3 is deleted and the following is substituted therefore

Engineer or Architect or Consultant referred in this tender document is

the person appointed by the Employer to act as Engineer for the purpose of this contract.

1.1.14 : Sub-clause 1.1.14 is deleted and the following is substituted therefore

“Approved” and “Approval” means approved in writing including subsequent written confirmation of previous oral approval.

1.1.17 : The following new Sub-clause 1.1.17 is added

“Day” means calendar day.

1.2 : Sub-clause 1.2 is deleted and the following is substituted therefore

Words importing the singular only also include the plural and vice versa and words importing the masculine gender shall include the feminine and neuter genders.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
216 of
225

CONDITIONS OF CONTRACT PART II

LIOC PLC

CLAUSE 2 : Duties and Power of Engineer's Representative

2(1) : The approval of the "Employer" is required before the "Engineer" can execute his duties in accordance with or as defined by the limits of the following clauses:

- (a) Clause 4 Sub-letting
Consenting to the sub-letting of a part of the works if the value of such part exceeds one percent (1%) of the sum indicated in the letter of Acceptance
- (b) Clause 51 Variations
Ordering a variation if the value of such variation is likely to exceed one percent (1%) of the sum indicated in the letter of Acceptance or Rupees One Million, whichever is less.
- (c) Clause 27 Fossils etc.
- (d) Clause 40 Suspension of work

CLAUSE 5 : Language/s and Law

5.1 : The Language is English

5.2 : First sentence "Except..... of the Contract". In the clause 5.2 is deleted and the following is substituted therefore:-

"The provisions of each of the following documents shall always prevail over those of the documents listed below it [Eg: The document listed in (c) will prevail over the document listed in (f)]:-

- (a) The Contract Agreement (when completed)
- (b) The Letter of Acceptance
- (c) The Drawings
- (d) Part I of these Conditions
- (e) Part II of these Conditions
- (f) Tender schedule (Bills of Quantities)
- (g) Specifications
- (h) Any other document forming part of the contract.

CLAUSE 9 : Contract Agreement

The following sentence is added to Clause 9 as the last sentence:-

"The stamp duty on the contract agreement is payable by the Contractor".

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
217 of
225

CONDITIONS OF CONTRACT PART II

LIOC PLC

CLAUSE 10 : Performance Bond

10(1) Delete Clause 10 and substitute as follows:

"The Contractor shall obtain security for the proper performance of the contract to a value of ten percent (10%) of the contract price and provide the Employer such security within fourteen (14) days after the receipt of the letter of acceptance. Such security or bond will be from a Licensed Commercial Bank in Sri Lanka in the form as annexed or any other form acceptable to the Employer. The costs of compliance with the requirements of this clause shall be borne by the Contractor".

10(2) The performance Security or Bond referred to in the Clause 10.2 shall remain valid until the issue of maintenance certificate in accordance with Clause 62(1).

CLAUSE 12 The following provision is added:-

"PROVIDED however the Employer shall not be liable to pay any such additional costs if such conditions or obstructions are proved to be for reasons beyond its control.

CLAUSE 14 Programme to be furnished

The programme shall be submitted within fourteen (14) calendar days after receipt of the Letter of Acceptance.

CLAUSE 15 Construction Management Services

15(1) The portion of this clause starting from "The cost of in line 12 until the end of the clause is deleted and the following is substituted thereof:-

"The cost of this service is deemed to be included in the rates and prices quoted by the contractor and shall not be claimed separately by the Contractor".

CLAUSE 19 Watching and Lighting

Add the following paragraph to this clause at the end thereof: -

"The Contractor shall indemnify the Employer in the event of any claim arising from any person as a result of the contractor not strictly adhering to the provisions of this clause.

"In the event of any claim or loss arising against or payable by the Employer as a result of the Contractor's failure or negligence to strictly adhere to the

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES- MALIGAWATTA, COLOMBO.

Page
218 of
225

CONDITIONS OF CONTRACT PART II

LIOC PLC

provision of this clause, the Contractor shall be liable to indemnify and keep the Employer indemnified by reimbursement of such claim or loss in a sum certified by the Engineer which sum shall be

deductible from the monies due to the Contractor from the Employer on any bill".

CLAUSE 20

Care of works

Clause 20(1)

The word "accepted" occurring in line 30 of Sub-clause 20(1) be corrected to read "excepted".

Clause 20(2) shall be deleted and the following new clause 20(2) be substituted therefore:

"20(2) The 'excepted risks' are (in the opinion of the Engineer) the risks for which the Contractor will not be able to obtain an insurance policy from an Insurance Company in Sri Lanka".

CLAUSE 21

Insurance of works etc.,

The additional sum referred to in Clause 21(a) shall be ten percent (10%) of the amount stated in the letter of acceptance.

CLAUSE 22

Damage to persons and property

22(1)

Item (c) be amended to read as follows:-

"Damage to property which is the unavoidable result of the execution or maintenance by the Contractor without negligence in accordance with the Contract.

22(2)

The following proviso is added to the clause 22(2) at the end therefore: -

"PROVIDED such claims proceedings damages coats charges and expenses arise solely due to the negligence of the Employer".

CLAUSE 24

24.1

Accidents and injury to workmen

Add the words "arising in respect thereof or in relation thereto. The amount certified by the Engineer as due and payable to the Employer by way of such indemnification shall be paid by the Contractor or deducted from the monies due from the Employer to the Contractor" at the end of this clause.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
219 of
225

CONDITIONS OF CONTRACT PART II

L IOC PLC

CLAUSE 36

36(2) Clause 36(2) is amended to read as follows: -

“(2) All samples shall be supplied by the Contractor at its own costs.

CLAUSE 45

The following sentence be added at the end of this clause: -

“For the purpose of this clause statutory days of rest means all the Mercantile Holidays as declared by the Government of Sri Lanka”.

CLAUSE 47

47(3) - Deleted-

CLAUSE 52

A new Sub Clause 52(6) is added as follows:

52(6) “Notwithstanding any other provision of the contract, if the Contractor intends to claim any additional payments, not mentioned in the Bills of Quantities, pursuant to any clause of these conditions or otherwise, the Contractor shall give notice of intent in writing to the Engineer within Twenty Eight (28) days after the event giving rise to the claim has first arisen”.

52(7) A new Sub Clause 52(7) is added as follows: -

Upon happening of the event referred to in Clause 52(6), the Contractor shall keep records as may be necessary to support any claim it may make. The Engineer upon receipt of notice of a claim may instruct the Contractor to provide any records, as may be material to the claim. The Contractor shall permit the Engineer to inspect all records the Engineer considers relevant and supply copies of same when called for.

52(8) A Sub-Clause 52(8) is added as follows: -

“Within Twenty Eight (28) days giving notice under clause 52(6), the Contractor shall send to the Engineer an account giving detailed particulars of the amount claimed and the grounds upon which it is based (together with the available documentary proof).

CLAUSE 53

Sub Clauses 53(5), 53(6), 53(6(a)) & 53(7) are deleted.

CLAUSE 60

Sub Clause 60(1) is deleted and mobilization advance shall not be paid: -

60(1) - Deleted-

60(2)(c) The materials referred to in this Clause (for payment of materials at site) shall be limited to: -

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
220 of
225

CONDITIONS OF CONTRACT PART II

L IOC PLC

- i. Steel
- ii. Aluminium components.

Monthly statements required in this Clause shall be submitted on or before the 10th day of the succeeding month.

60(7) Sub Clause 60(7) is amended as follows: -

In each of lines 5 and 14 the words and figures "ten (10)" be deleted and the following be substituted therefore: -

"Fourteen (14)"

CLAUSE 65

65(1) Last paragraph of this Clause "The Employee shall indemnify.connection therewith" is deleted.

65(5) This sub-clause be deleted and the following new sub-clause 65(5) be substituted therefore: -

65(5) The special risks are " the excepted risks" within the meaning of the amended clause 20(2)".

65(8) Items (d), (e) and (f) are deleted.

CLAUSE 66

66(1) The words " The same as that.....hereof" in lines 8 to 11 be deleted and the word "payable" shall be substituted therefore.

CLAUSE 67 Clause 67 be deleted and the following new clause 67 be substituted therefore: -

67. - Deleted-

CLAUSE 68 The words "registered express" be inserted between the words "by" and "post" in the third line.

CLAUSE 70 Original Clause 70 is deleted and the following is substituted therefore: -

70(1) "The accepted tender will be treated as firm and inclusive of all expenses and taxes payable by contractor and applicable during the entire period of construction".

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
221 of
225

CONDITIONS OF CONTRACT PART II

L IOC PLC

70(2) Notwithstanding any other provisions of this Contract, no variation howsoever in prices will be paid to or deducted from the contractor for fluctuation in prices of materials, components, skilled and unskilled labour and the Contractor will not be entitled to any variation in prices on account of changes in taxes, etc., for imported items/components.

70(3) The Employer will deduct from the monies due to the Contractor all statutory deductions if any deductible on account of the Contractor and remit to the relevant authorities. A certificate will be issued by the Employer stating the amount deducted and to whom such

amounts have been paid. The Contractor shall furnish relevant Tax file numbers to the Employer.

CLAUSE 71 Clause 71 is deleted.

CLAUSE 72 Clause 72 is deleted.

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
222 of
225

FORMAT OF BANK GUARANTEE

To:

M/s Lanka IOC PLC
Level-20, West Tower,
World Trade Centre,
Colombo-01

Dear Sirs,

1. In consideration of the Lanka IOC PLC, hereinafter called "the Seller" (which expression shall include its successor in interest & assigns) having agreed to sell to M/s _____ (Name and location) having its office at _____ hereinafter called "the Buyer" (which expression shall include its successor in interest & assigns and executors as the case may be) _____ (Name of Product) on the terms and conditions mentioned in the agreement / purchase order no. _____ dated _____ and in accordance with the agreement mutually agreed pursuant to the said agreement / purchase order (hereinafter collectively referred to as "Agreement") the seller has agreed to accept Bank Guarantee for Rs _____ (Rs value in words) towards the value of _____ (Name of Product) stated in the agreement from the buyer in lieu of the credit given to the buyer. W, _____ (Details of bank issuing BG) at the request of the Buyer do hereby undertake to pay to the seller an amount not exceeding Rs. _____ (Rs value in words) against any loss or damage caused to/ suffered or would be caused to or suffered by seller by Reason of any breach by the buyer of any of the terms of conditions contained in the Agreement.

2. We _____ (indicate name of the Bank) do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the seller stating that the amount claimed is due by way of loss or damage caused to or suffered by the seller by reason of breach by the said buyer of any of the terms or conditions contained in the said agreement or by reason of the buyer's failure to perform the said agreement. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.

3. We undertake to pay to the Lanka IOC PLC any money so demanded not withstanding any disputes raised by the buyer in any suit or proceeding pending before any court of Tribunal relating thereto our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the buyer shall have no claim against us for making such payment.

4. We, _____ (name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the seller under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Lanka IOC PLC certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said buyer and accordingly discharge this guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before _____ we shall be discharged from all liability under this guarantee thereafter.

5. We, _____ (name of the Bank) further agree with the seller that the seller shall have the fullest liberty without our consent and without affecting in any manner our

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
223 of
225

obligations hereunder to vary any of the terms and conditions of the said agreement or to extend time of performance by the said buyer from time to time or to postpone for any time or from time to time any of the powers exercisable by the Lanka IOC PLC against the said Seller and to forebear or enforce any of the terms and conditions relating to the said agreement and shall not be relieved from our liability by reasons of any such variation, or extension being granted to the said Seller or for any forbearance act or omission on the part of the seller or any indulgence by the seller to the said buyer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provisions have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Buyer.

7. The bank agrees that this guarantee may be invoked on a number of occasions but that the total amount payable hereunder shall not exceed Rs _____.

8. The Bank Guarantee is operable/ payable at Colombo branch.

9. We, _____ (name of the Bank) lastly undertake not to revoke this guarantee its currency except with previous consent of the seller in writing.

10. Notwithstanding anything contained herein above, a. The liability of the bank under this Guarantee shall not exceed the amount of Rs. _____ (Rupees _____ only).

b. This guarantee is valid up to _____ irrespective of whether or not the original guarantee returned to us.

The confirmation of this bank guarantee is available with our controlling office. The beneficiary in his own interest should obtain such confirmation from the controlling office at the following address:

CONFIRMING OFFICE ADDRESS:

ISSUING BRANCH

ADDRESS:

PLACE: (Name & Signature of the Bank)

DATE:

SIGNATURE OF TENDERER
SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.

Page
224 of
225

FORMAT OF WARRANTY

MODEL PROFORMA FOR PERFORMANCE WARRANTY FOR RECESSED MOUNTED UNDER CANOPY
LED LIGHTING FIXTURE FOR 60 MONTHS (5 YEARS)

INDEMNITY BOND FOR PERFORMANCE-CUM-WARRANTY

TO M/S. Lanka IOC PLC

SUB

1. WORK ORDER NO :DT :-

2.AGREEMENTNO :-.....DT :-

This Indemnity bond for performance-cum-warranty guarantee executed atthisday
of monthof by M/s.....(The successful tenderer) hereinafter called the
"CONTRACTOR" (which expression shall mean and include, if the context so admits, the partners or
partner for time being of the firms & their prospective heirs, executors, administrators, successors and
assigns in Law) in favored:

M/s Lanka IOC PLC, a company incorporated under the Companies Act 7 of 2007 and having its
Registered Office at Level 20, West Tower, World Trade Center, Echelon Square, Colombo 01,
hereinafter called the "OWNER". (which expression shall include its administrators, successors and
assigns in Law).

WHEREAS, the "OWNER 'is desirous of having recessed mounted under canopy LED lighting fixture
works as

Specified in the Work Order No.....Dated issued by the"OWNER " _from the
successful renderer who had participated intender no. invited by the "OWNER" and,
opened on datehas caused drawings specifications and bill ofquantities showing and
describing the work to be done, prepared and the same have been signed by or on behalf of the
successful tenderer.

WHEREAS the successful tenderer has agreed with the "OWNER" to execute and perform the said
work specified in the work order upon terms & conditions provided in the Agreement executed
between the "CONTRACTOR" and the "OWNER" and also contained in the General conditions of
Contract attached hereto.

Whereas as per requirement of the Owner the Contractor, I required to provide joint warranty for five
years from the date of dispatch from manufacturer's warehouse along with the manufacturer and the
Contractor has agreed to give an indemnity bond cum warranty on the below mentioned terms and
conditions

IT IS, THEREFORE, THE INTENT OF THIS INDEMNITY BOND FOR PERFORMANCE-CUM- WARRANTY
GUARANTEE BY THE "CONTRACTORS" TO PROVIDE A WARRANTEE OF FIVE YEARS FROM THE DATE OF
INSTALLATION ON THE RELEVANT RETAIL OUTLET, TO INDEMNIFY AND KEEP INDEMNIFIED THE
"OWNER 'AS STATED HERE IN AFTER:

The "CONTRACTOR" hereby confirms having carefully examined the specifications relevant to LED
fixtures, technical specifications & workmanship pertaining to fabrication, erection etc. specified by
the "OWNER" in the tender documents, considering all technical aspects & climatic conditions

SIGNATURE OF TENDERER

SEAL



TENDER NO: LIOC/ ENG/ PT-03/ 2025-26

**TITLE: CONSTRUCTION OF SALES AND ALLIED ELECTRICAL WORKS AT
LANKA IOC PLC "A" SITE PETROL SHED M/S SLIPTO AGENCIES-
MALIGAWATTA, COLOMBO.**

**Page
225 of
225**

prevailing at the location, the "CONTRACTOR" confirms that specified LED fixture is fully suitable for the desired services on Retail Outlets of LANKA IOC spread all over Sri Lanka.

The "CONTRACTOR" hereby confirms to repair/replace any defect in LED lighting fixture arising during the guarantee period of 60 (Sixty) months at no extra cost to the "OWNER".

The "CONTRACTOR" hereby confirms that incase of premature LED fixture failure, they will supply free of cost and replace /rectify, at no extra cost to the "OWNER" those defective areas where pre- mature LED fixture failure has been noticed by the "OWNER".

The "Contractor " warrants the LED fixture to be free from defects in manufacturing, workmanship and functionality for a period of 5 (Five) years from the date of Installation in the relevant RO.

The commencement date for this warranty is the actual date of completion of all works under the work order placed on the" Contractor".

The Indemnity bond for performance-cum-warranty guarantee shall be governed by the laws of Sri Lanka and the courts at Sri Lanka will have the jurisdiction for enforcing this indemnity bond performance- cum warranty guarantee.

WITNESS:

CONTRACTOR

DATE:

**SIGNATURE OF TENDERER
SEAL**